VOLUME 8 • NUMBER 12 • DECEMBER, 1937

METALS and ALLOYS

The Magazine of Metallurgical Engineering

PRODUCTION • FABRICATION • TREATMENT • APPLICATION

H. W. Gillett, Editorial Director
Battelle Memorial Institute, Columbus
Edwin F. Cone, Editor
Fred P. Peters, Assistant Editor

ADVISORY BOARD

H. A. ANDERSON
Western Electric Company
WILLIAM BLUM
Bureau of Standards
A. L. BORGEHOLD
General Motors Corporation
P. H. BRACE
Westinghouse Electric & Mfg. Co.
G. H. CLAMER
Ajax Metal Company
JUNIUS D. EDWARDS
Aluminum Company of America
O. W. ELLIS
Ontario Research Foundation
H. J. FRENCH
International Nickel Company, Inc.
JOHN HOWE HALL
Consultant
S. L. HOYT
A. O. Smith Corporation
J. B. JOHNSON
Wright Field Air Corps, War Dept.
JOHN JOHNSTON
United States Steel Corporation
JAMES T. MACKENZIE
American Cast Iron Pipe Company
C. A. MCCUNE
Magnaflux Corporation
R. F. MEHL
Metals Research Laboratory, C.I.T.
W. B. PRICE
Scovill Manufacturing Company
LEO F. REINARTZ
American Rolling Mill Company
H. A. SCHWARTZ
Nat'l Malleable & Steel Castings Co.
F. N. SPELLER
National Tube Company
JEROME STRAUSS
Vanadium Corporation of America

Published Monthly by Reinhold Publishing Corporation, East Stroudsburg, Pa., U.S.A. Ralph Reinhold, President and Treasurer; H. Burton Lowe, Vice President and Secretary; Philip H. Hubbard, Vice President; Francis M. Turner, Vice President. Executive and Editorial Offices, 330 West 42nd Street, New York. Price 40 cents a copy. Annual Subscription: U. S., Possessions and Canada, $3.00. All Other Countries, $4.00. (Remit by New York Draft). Copyright, 1937, by Reinhold Publishing Corporation. All rights reserved. Entered as second class matter June 12, 1934, at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879.

ARTICLES

Bright Annealing of Seamless Steel Aircraft Tubing . 331
H. R. LEWIS

The Pitting of Stainless Steel 335
W. A. WESLEY AND C. H. LINDSLEY

Temperature of Recrystallization of Nickel . . . 339
ERICH FETZ

Relation Between the Grain Areas and the Grain Size of the Metal . . . . , . . . 345
J. J. B. RUTHERFORD, R. H. ABORN AND E. C. BAIN

Is Beryllium Ductile? 349
W. KROLL

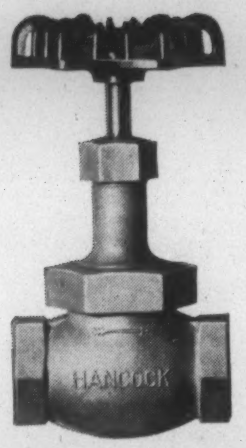
Corrosion and Corrosion-Resistant Metals and Alloys . 355
V. V. KENDALL

Highlights . . . . A 19
Editorial . . . . A 21
Book Reviews . . . . MA 780
Current News Items . . . . MA 782
Manufacturers' Literature . . . . . . MA 783
New Equipment and Materials . . . . . MA 787

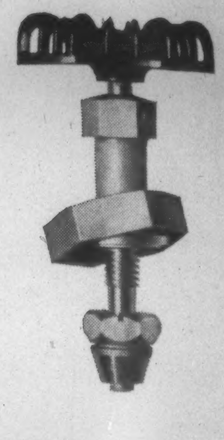
METALLURGICAL ABSTRACTS

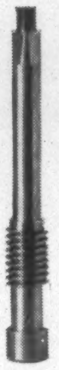
Ore Concentration . . . . MA 724
Ore Reduction . . . . MA 726
Melting, Refining and Casting . . . . MA 727
Working . . . . MA 732
Heat Treatment . . . . MA 734
Furnaces, Refractories and Fuels . . . . MA 742
Joining . . . . MA 747
Finishing . . . . MA 752
Testing . . . . MA 755
Metallography . . . . MA 758
Properties of Metals and Alloys . . . . MA 763
Effects of Temperature on Metals and Alloys . . . . MA 767
Corrosion and Wear . . . . MA 768
Applications of Metals and Alloys . . . . MA 773
General . . . . MA 776

★



THEY PLANNED TO BUILD A SUPER-VALVE WITH A STEM OF SUPER-STRENGTH AND TOUGHNESS





REVERE TECHNICAL ADVISORY STAFF HELPED THEM CHOOSE THE RIGHT METAL

Mr. Louis Brendel, of the Hancock Valve Division of Manning, Maxwell & Moore, Inc., tells the story. Mr. Brendel says:

"The new valve has caused a sensation. Our sales increased 500% in six months. The strength and hardness of the Revere material we are now using enables our valve stems to outlast ordinary valve stems two to three times. So great is the strength of these stems that nails can be mashed between the seats and discs of our valves.

"In a breakdown wear test, there were still very definite threads on the stems made of the Revere material after 25,000 operations—although stems of competitive material were completely stripped at 8,000 operations."

This is a typical example of Revere Technical Advisory Service to industry. A Revere Technical Advisor studied the application, requirements, method of machining, cost factors—made recommendations. The Revere metal recommended (Revere Roman Bronze) was tried, found satisfactory. Hancock sales boomed.

A Revere Technical Advisor can be assigned to work with you and your engineers on your products, in your plant, on any problem involving possible use of copper or copper-base alloys in any commercial form. This service carries no obligations. Inquiries regarding this service should be directed to Executive Offices, 230 Park Ave., N. Y. C.

Revere Copper *and* Brass

INCORPORATED

FOUNDED BY
PAUL REVERE
1801

EXECUTIVE OFFICES: 230 PARK AVENUE, NEW YORK CITY • MILLS: BALTIMORE, MD. • TAUNTON, MASS.
NEW BEDFORD, MASS. • ROME, N. Y. • DETROIT, MICH. • CHICAGO, ILL. • SALES OFFICES IN PRINCIPAL CITIES

★

Highlights

WRITTEN BY THE ABSTRACT SECTION
EDITORS AND THE EDITORIAL STAFF

Do you want to know what metallurgical engineers are saying, the world over? Look in the Current Metallurgical Abstracts. Here are some of the points covered by authors whose articles are abstracted in this issue.

Wetting Agents for Flotation

Organic wetting agents have solved a lot of problems for chemical engineers in the last few years, and have been a prolific source of patents. Dean, Clemmer, and Cooke (page MA 725 L 3) evaluate wetting agents for flotation, and indicate that these substances may have a great future in ore dressing.—J. A.

Gas Welding Stainless Steels

18-8 stainless steel has a coefficient of expansion about 50 per cent greater than ordinary mild steel, but its thermal conductivity is only about 40 per cent as much. In welding stainless steels, therefore, greater care must be taken to prevent buckling, warping and cracking. The metal tends to creep or crawl under the heat of the torch and must be controlled by manipulation, or with suitable jigs. The latter must not restrain movement of the metal too forcibly, however, or buckling or cracking may result.

Also stainless steel overheats more easily than mild steel, unless a welding tip at least one size smaller than for mild steel of same thickness is used. Chill plates assist in preventing overheating. When placed under the weld they should be grooved in center to avoid undue chilling of weld metal penetrating the vee.

A strictly neutral oxyacetylene flame should be used and welding done as quickly as possible with no puddling. Keep welding rod at tip of inner flame cone and the flame playing on molten pool, the surface of which is left undisturbed. Use of an approved flux, applied to welding rod and bottom of welding vee is recommended. All welding oxides should be removed and welds polished (page MA 747 L 9).—E.V.D.

Precision Comes to the Iron-Carbon Diagram

Indications that metallurgy may become an exact science appear from time to time. The latest concern the important Fe-C diagram, which has come a very long way since the days of Roozeboom, and which is still chanaging. It seems likely, though, that Mehl and Wells (page MA 758 R 3) have lashed down the eutectoid region for good—or if not for good, for a long time. This paper is required reading: The experimental work is a model of conception and execution; the paper itself is a model of exposition.

The peritectic region has been reinvestigated by Adcock (page MA 758 R 6) and it seems that more is to come. (Readers of Section Editor Epstein's "The Alloys of Iron and Carbon" will realize that such information is very welcome.) No spectacular changes result from Adcock's work, but here again advance has been made toward a rigidly quantitative diagram. Metallurgists will soon be able to challenge chemists to produce phase diagrams of comparable exactness.—J.S.M.

Manganese

Liberman (page MA 764 L 6) speaks a good word for a Cr-Mn-Mo steel for use with superheated steam as against those without an alloying amount of Mn.—H.W.G.

Corrosion

Electrical measurements of the potential of a metal surface, the method varying with the worker, but the underlying ideas being somewhat similar, are advocated in corrosion studies by Burns (page MA 768 L 6), Brennert (page MA 768 R 8), Yamamoto (page MA 768 L 8) and Thyssen and Marechal (page MA 768 L 10). When similar ideas are being developed and reported on in four countries at the same time, the viewpoints should be varied enough to insure ultimately finding out the value of such methods.—H.W.G.

"4 to 6"

According to Britton (page MA 768 L 3) the low alloy steels that give much longer life to failure than carbon steel in atmospheric exposure should rust just as quickly when painted. This is in line with the fact that the bare steels run neck and neck in acquiring the initial rust coat, it's the type of coat that builds up as time goes on that counts. So if we're painting steel for appearance only, steel appears to be steel, whether carbon or low alloy.—H.W.G.

Welding

The welders certainly believe in telling the world every time they do a job by welding that used to be done some other way. Some month among the welding abstracts we expect to find a description of welding diapers to dispense with the hazard of safety pins.—H.W.G.

High-Speed

Russian investigators (page MA 764 R 6 and R 8) discussing (a) ordinary high-speed cooled in a lead bath before oil-quenching and (b) high Cr, high V, W-free steels quenched in the ordinary way, agree that in the final draw, repeated short draws with cooling periods give better results than one uninterrupted draw.—H.W.G.

Discrepancies in Creep Properties

Jenkins and co-workers (page MA 767 L 4) cite vast differences in creep values of different lots of carbon steels. The differences are as yet unexplained.—H.W.G.

Sizing the Blast Furnace Charge

Shapalov (page MA 726 L 3) gives experimental data on effect of sizing of ore and coke upon necessary blast pressure that are of some interest to blast furnace men.—H.W.G.

Consumptibility

Live and learn, as a metallurgical word this was new to our vocabulary. See Beck (page MA 758 R 9) for the definition. —H.W.G.

Grain Size

Gruzdov and Fedorchenko (page MA 758 L 9) discuss a heat-tinting method for determination of actual grain size, adding another to the long roster of those who desire information obtained under more varied conditions than those of the McQuaid-Ehn test.—H.W.G.

Gold

The instability of gold prices and the value of the dollar are now explained, since Trillat and Oketani (page MA 758 L 5) claim that Au has two crystal forms. If true it seems odd that it hasn't been found before. It's lucky that manganese isn't a monetary metal, for Yoshisaki (page MA 758 L 3) finds three modifications of that. Oh well, go on making two lattices exist for one that was known before.—H.W.G.

Too Complex

Nishimura (page MA 758 L 7) talks about a compound, $Al_{13}Cu_7Mg_8$, which for brevity he calls "S." Shucks, we don't believe nature is that complicated.—H.W.G.

Burrs

Jevons (page MA 733 L 2) says that in blanking steel sheets in dies some throw burrs and some don't. The two kinds are indistinguishable save by a higher proportional limit in good steels.—H.W.G.

Flame Cutting and Warping

Metals expand when heated, depending upon the increase in temperature. Where the heat is localized, as in flame cutting, the part is apt to warp, unless (1) its strength and stiffness are sufficient to resist the forces set up; (2) it is held firmly in position by clamps or weights while being cut and while cooling to room temperature afterward; (3) it is cut simultaneously or in rapid succession about its neutral axis, thus equalizing the forces and eliminating their effect. Unless very narrow, there is little tendency for parts ½-in. or more thick to warp or buckle from cutting. In cutting off rods, bars, structural shapes, rail piping and similar lengthy materials, warping is not encountered. However, where great accuracy is demanded in overall dimensions of a cut part, a correction factor must be included in the layout. This is because the heat of flame cutting causes expansion immediately ahead of and behind the point of cutting. Upon cooling to room temperature the part will be found to have shrunk slightly. In splitting flat bar stock, structural I-beams, channels and similar narrow materials, "skip-cutting" is used to prevent warpage. By this method, the cut is made to skip at intervals, leaving a series of uncut sections which hold the material in line until cooled, whereupon they are also cut through to separate the part (MA 747 L 5). —E.V.D.

STABILITY

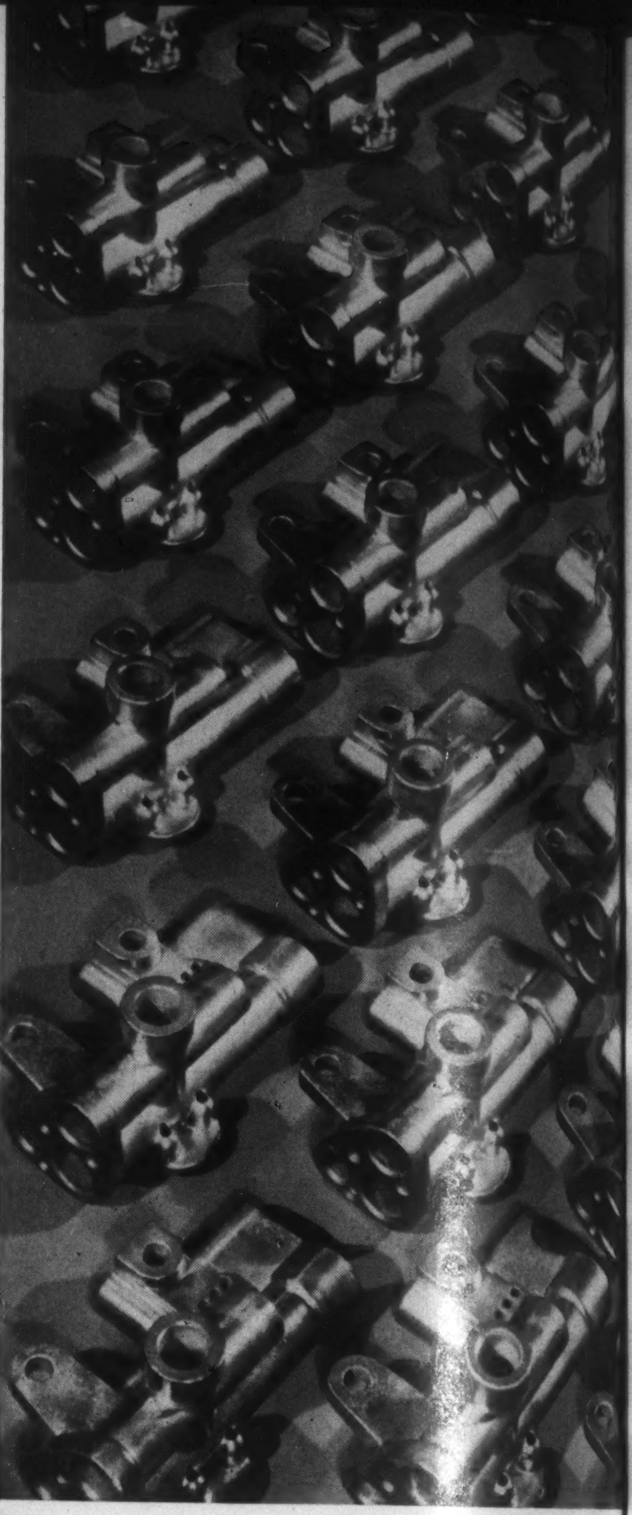
— key to lasting accuracy

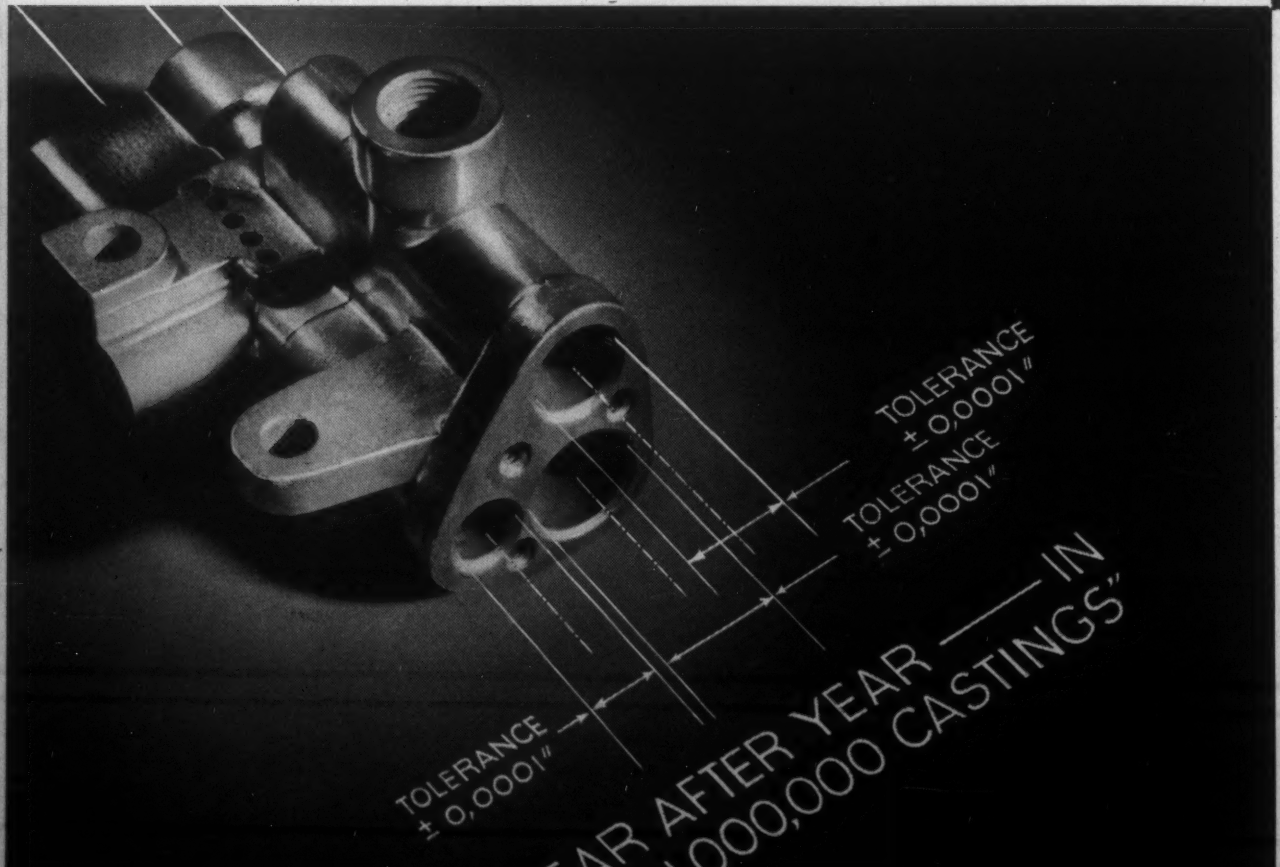
Over a million clutch-control valve bodies of the type illustrated are in service on up-to-the-minute automobiles—with the broached bore diameters of each held to hair-splitting tolerances. The proper ZINC Alloy and a brief simple heat treatment do the trick most economically.

Today's improved ZINC Die Casting Alloys retain their properties year after year—strong and "on the button" for accuracy. That's why these alloys are opening the conveniences and economies of die casting to a growing list of alert manufacturers long harried with costly machining operations in the interest of precision.

The superior castability of the ZINC Alloys permits cored holes and intricate shapes to circumvent machining; their excellent machinability makes easy and light such operations as are necessary; and their stability assures lasting accuracy.

THE NEW JERSEY ZINC COMPANY
160 FRONT STREET NEW YORK, N. Y.

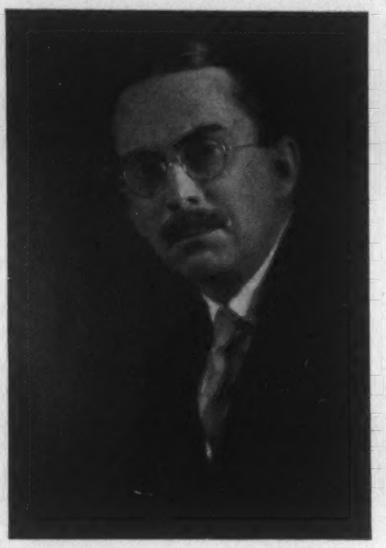




PHYSICAL AND
FABRICATING PROPERTIES
of a material determine its usefulness.
This is No. 3 in a series of advertisements interpreting the properties of the
ZINC ALLOYS used for DIE CASTIN

The Research was done, the Alloys were developed, and most Die Castings are specified with
HORSE HEAD SPECIAL (99.99+% Uniform Quality) ZINC

EDITORIAL



John Howe Hall Joins Our Advisory Board

METALS AND ALLOYS is happy to announce that John Howe Hall has accepted the invitation to serve on the Editorial Advisory Board.

Mr. Hall has been through the entire ferrous foundry game—from metallography to the economics of furnace and foundry operation. His experience also includes the manufacture of gas cylinders and of special welding rods as well as in the choice of materials for resisting heavy wear, etc. Thus he is more than just a steel foundry specialist and consultant.

Educated at Harvard, and trained in several steel mills and foundries, he has spent most of his career as technical assistant to the President of the Taylor Wharton Iron & Steel Co. Recently he turned to consulting practice. Early in his career he wrote "The Steel Foundry" a book which, though published long ago, still holds its place as a standard text.

He has been active in all the metallurgical societies, especially in the American Foundrymen's Association, from which he received the Whiting medal and was also honored by selection to write an "exchange paper" for presentation abroad. He was recently made chairman of the steel division of the A. F. A. His numerous contributions to technical societies and the technical press have been of a high order. He delivered a Howe Memorial Lecture of the A. I. M. E.

His wide background and experience, plus his pungent and pithy mode of expression, are in evidence when he discusses a paper at a convention. That METALS AND ALLOYS will have the benefit of his fund of experience and common-sense in the editorial counsels is a real and valuable asset.—The Editors.

Nomenclature

The use of copper in steel brought no complications of nomenclature as long as the only commercial copper steel was that made for resistance to atmospheric corrosion and containing about 0.20 per cent Cu. As a group of so-called "low alloy high yield strength" steels normally contain that much copper, whatever else is added, some of them approximately double or triple this copper content, especially when phosphorus enters as an alloying element, and several depend upon copper as the primary alloying element, using 1 per cent or more.

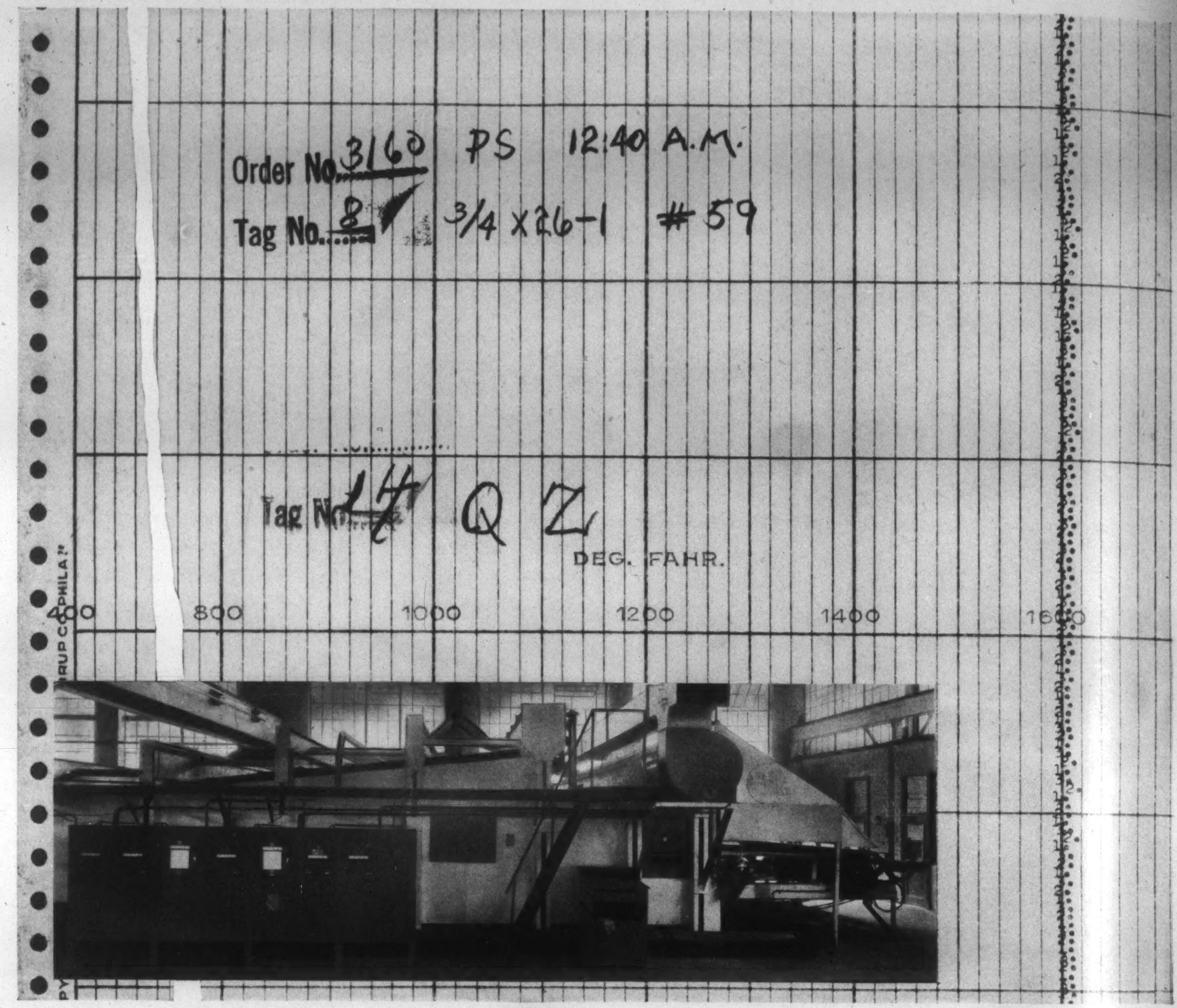
"Low alloy, high yield strength" is altogether too long and cumbersome a term, and there are signs of a tendency to class all these as "Corten-type," from the trade name of the first of the group to be widely publicized. This generalization of a trade name is doubtless as unsatisfactory to the makers of Corten as to the makers of the other steels of its type. The comparisons of corrosion resistance of those steels of this type for which superiority over "copper steel" is claimed have proven quite confusing to the layman especially when he finds out that the steel being compared with "copper steel" itself contains copper.

The terms "copper-bearing" for the 0.20 per cent Cu, and "non-copper", for plain carbon steel that does not carry enough residual copper to put it in the "copper-bearing" class, were used by the A.S.T.M. in its reports of the atmospheric exposure tests on the two classes, and caused no confusion. At present, however, the "L.A.H.Y.S." group is even more emphatically "copper bearing."

Since by "plain carbon" or "plain nickel" steel we mean respectively one to which no alloying elements are and one to which nickel only is added, it would seem that the 0.20 per cent Cu class would be best disposed of by referring to it as "plain copper steel." Without further qualification, that term would signify the same as the A.S.T.M. description of "copper-bearing," and in case other copper ranges come into play, the selection of qualifying phrases is simple.

The "Irish Stew" steels in which 3 or more of the elements Cu, Cr, Mn, Si, Ni, Mo, V and P are used in strength-giving, alloying, percentages, have in several cases been given trade names indicative of the predominating element, but several are so balanced that it would be anybody's guess which element predominates, so their trade names either imply strength or merely utilize the company name of the maker. The users and potential users have to consider all these steels in one general class for which no name both sufficiently short and sufficiently apt has yet been suggested. For one's own purposes, a designation such as "group Y steels", to indicate that the steels are developed with an eye to enhanced yield strength, might serve, but any such designation would need general acceptance before it would become accepted as intelligible as well as convenient.

It is irritating to require so many words to express an idea where the idea itself is rather clear cut, and while this sort of thing isn't of the type whereon the fate of nations hangs, it does seem to demand attention by committees on nomenclature.—H. W. G.



IN BIG FURNACES LIKE *This* . . GET UNIFORMITY LIKE *This* . . WITH

MICROMAX ELECTRIC CONTROL

Here's a 64-burner gas-fired furnace, more than forty feet square *inside*—for continuous normalizing of "sucker rods." Yet, big as it is, it's so precisely regulated by Micromax Electric Controls that couples located at points of greatest temperature departure always stay within ± 10 degrees, and generally within half that limit. Its owner, the Axelson Mfg. Co., St. Louis, reports "no difficulty whatever" in holding these temperature limits.

For all its effectiveness, Micromax Electric Control is so simple, so sensitive and so correct in operating principle, that one of the identical Micromax Pyrometer and Drive Unit combinations on this furnace could be used "as is"—without the removal or addition of a single part—on a tiny oven furnace, a pot furnace, still or practically any other heat-using equipment. You can standardize on Micromax Electric Control for every furnace. You can have big-furnace dependability of control for the small units; small-furnace simplicity for the big ones.

LEEDS & NORTHRUP COMPANY, 4925 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

J-NA(7)

CURRENT METALLURGICAL ABSTRACTS

A DIGEST OF THE IMPORTANT METALLURGICAL DEVELOPMENTS OF THE WORLD

EDITOR • EDWIN F. CONE

Assistant Editors
FRED P. PETERS
DORIS MOYNIHAN

SECTION EDITORS—*John Attwood, C. S. Barrett, C. H. Chatfield, G. L. Craig, H. C. Cross, E. V. David, A. W. Demmler, A. H. Emery, S. Epstein, M. Gensamer, H. W. Graham, O. E. Harder, G. R. Harrison, C. H. Herty, V. V. Kendall, J. S. Marsh, M. H. Mawhinney, H. F. Moore, A. J. Phillips, H. S. Rawdon, L. Reid, W. A. Tucker.*

ABSTRACTORS—*N. W. Ageew, A. A. Anderson, G. Ansel, C. R. Austin, R. E. Bannon, W. H. Boynton, Janet Briggs, Madge Brook, W. H. Bruckner, R. W. Buzzard, J. C. Chaston, Frances Clark, W. L. Cockrell, A. W. Contieri, R. J. Cowan, B. N. Daniloff, Gerhard Derge, J. W. Donaldson, H. C. Duus, E. Fetz, J. D. Gat, H. W. Gillett, B. W. Gonser, J. L. Gregg, G. E. Guellich, M. E. Haas, M. Hartenheim, C. Heath, F. B. Hobart, G. B. Hogaboom, A. Hone, L. Issakow, C. E. Jackson, C. B. Jenni, J. B. Johnson, E. R. Kaiser, H. F. Kaiser, H. Kishimoto, H. Kleinhenz, P. R. Kosting, E. C. Kron, A. I. Krynitsky, V. Kusnetzoff, D. J. Martin, Lois McCombs, F. R. Morral, G. T. Motok, T. Murakami, G. Neuendorff, H. Nishimura, Frank G. Norris, John Occasione, Y. Ogawa, Fred P. Peters, V. Polansky, H. W. Rathman, Hans Röhrig, P. C. Rosenthal, H. W. Russell, C. M. Saeger, Jr., G. P. Sanders, T. Sato, M. Schrero, C. W. Schuck, N. Shibata, H. A. Smith, A. P. Som, John Soroka, W. H. Spencer, O. R. Spies, A. George Stern, Robert Stith, B. H. Strom, S. Takada, K. Tamaru, Leo J. Waldron, M. P. Walle, W. A. Welcker, Cyril Wells, H. M. Wilten, A. B. Winterbottom, R. A. Witschey.*

CLASSIFICATIONS

1. ORE CONCENTRATION—*Crushing, Grinding & Plant Handling (1a), Gravity Concentration (1b), Flotation (1c), Magnetic Separation (1d), Amalgamation, Cyanidation & Leaching (1e).*

2. ORE REDUCTION—*Non-Ferrous (2a), Ferrous (2b).*

3. MELTING, REFINING AND CASTING—*Non-Ferrous (3a), Ferrous (3b).*

4. WORKING—*Rolling (4a), Forging & Extruding (4b), Cold Working, including Shearing, Punching, Drawing & Stamping (4c), Machining (4d).*

5. HEAT TREATMENT—*Annealing (5a), Hardening, Quenching & Drawing (5b), Aging (5c), Malleableizing (5d), Carburizing (5e), Nitriding (5f).*

6. FURNACES, REFRACTORIES AND FUELS

7. JOINING—*Soldering & Brazing (7a), Welding & Cutting (7b), Riveting (7c).*

8. FINISHING—*Pickling (8a), Cleaning, including Sand Blasting (8b), Polishing & Grinding (8c), Electroplating (8d), Metallic Coatings other than Electroplating (8e), Non-Metallic Coatings (8f).*

9. TESTING—*Inspection & Defects, including X-Ray Inspection (9a), Physical & Mechanical Testing (9b), Fatigue Testing (9c), Magnetic Testing (9d), Spectrography (9e).*

10. METALLOGRAPHY

11. PROPERTIES—*Non-Ferrous (11a), Ferrous (11b).*

12. EFFECT OF TEMPERATURE

13. CORROSION AND WEAR

14. APPLICATION—*Non-Ferrous (14a), Ferrous (14b).*

15. GENERAL—*Economic (15a), Historical (15b).*

1 • ORE CONCENTRATION

JOHN ATTWOOD, SECTION EDITOR

Gold Ore from Red Lake Gold Shore Mines, Red Lake Area, Patricia Portion, Kenora District, Ontario. W. B. TIMM ET AL. *Can. Dept. Mines, Mines & Geol. Branch Rept.* No. 771, 1937, pp. 175-183. The ore, assaying Au 1.06 and Ag 0.09 oz./ton, responds readily to cyanidation. Use of traps or Au jigs prior to agitation is recommended. **Gold Ore from Laguna Gold Mine.** *Ibid.*, pp. 184-187. Unless the ore, assaying 0.60 oz. Au/ton, is ground 95% —200 mesh, cyanidation gives erratic results, due to coarse Au. About 99% extraction can be obtained at 50% —200 mesh by traps or blankets (discharge to classifier), barrel amalgamation of concentrate, and cyanidation of barrel tailing and classifier overflow. **Gold Ore from the Pamour Porcupine Mine, Situated at Three Nations, in Whitney Township, Cochrane District, Porcupine Mining Division, Ontario.** *Ibid.*, pp. 188-198. The Au is associated with sulfides which require extremely fine grinding for cyanidation. The ore may be ground in cyanide with concentration and fine grinding of sulfides or ground in H_2O, sulfides floated, reground and cyanided to give 97-98.5% extraction. **Gold Ore from Seal Harbour Mine, Stormont Gold District, Guysborough County, Nova Scotia.** *Ibid.*, pp. 214-219. The ore, containing 0.50-0.66 oz. Au/ton, can be treated by either of 2 processes: (1) Cyanidation with removal of coarse Au by traps, jigs or blankets, the concentrate to be barrel amalgamated and the tailing returned for regrinding; (2) amalgamation and concentration, with cyanidation of the concentrate. The tailings from amalgamation could be tabled or floated and the concentrate reground and cyanided. Or, the ore could be ground with a classifier in closed circuit, with traps on the mill discharge, the classifier overflow going to flotation, the flotation tailing to tables; the trap and table concentrate could be barrel amalgamated, the amalgamation tailing and flotation concentrate cyanided. Over 90% of the Au can be amalgamated at relatively coarse grinds, the rest is associated with sulfides, chiefly arsenopyrite. AHE (1)

"Dzhezkazganstroi." P. I. SHINDELMAN. *Tsvetnye Metal.*, No. 7-8, Aug.-Sept. 1936, pp. 5-11. A description of the ore deposits and of the proposed Cu concentration and smelting plant at Dzhezkazgan, Russia. The amount of metallic Cu in all categories of the ore is estimated at 3.5 million tons. The average Cu content of the ores is 1.65%. The ores are of both sulphidic and oxidized types. Plans have been completed for the construction of a plant capable of producing 200,000 tons Cu annually. It is expected that the plant will be completed and will begin producing Cu at the end of 1940. BND (1)

Tin Making in Western Australia—Revival of Activity at Greenbushes. *Chem. Eng. Mining Rev.*, Vol. 29, June 8, 1937, pp. 346-348. The Sn occurrences are of 3 classes: (1) the alluvial and wash types, (2) the true lode types, and (3) the stockworks type. WHB (1)

Milling of Copper-arsenical Gold Ore—Highly Refractory Cassilis Ore Responds to Flotation and Cyanidation. E. GRENVILLE-HOLT. *Chem. Eng. Mining Rev.*, Vol. 29, July 8, 1937, pp. 373-376. Descriptive. King Cassilis ore requires grinding to —200 mesh for cyanidation, with some value still inaccessible. The presence of chalcopyrite is an obstacle to direct cyanidation, but if removed in a flotation concentrate the residues are then amenable to cyanidation. The completeness of removal of the chalcopyrite is the essential factor in limiting the cyanide consumption. The ore is treated either by flotation or direct cyanidation according to the Cu content. WHB (1)

Mining and Milling Methods at the Pilgrim Mine, Chloride, Ariz. EARL F. HASTINGS. *U. S. Bur. Mines, Information Circ.* No. 6945, June 1937, 18 pp. A Au-Ag concentrate is made by flotation using Aerofloat 15 0.11, pentasol xanthate 0.09, amyl xanthate 0.06, ethyl xanthate 0.04, Frother B-23 0.01 and soda ash 0.05 lb./ton. Concentrates are amalgamated continuously in barrels. The sponge from retorting the amalgam averages 680 fine Au and 305 fine Ag. Au recovery is 91.9%, Ag 73%; Ag recovery can be increased by using ammonium phosphate but at a lower ratio of concentration. Milling costs are $1.048/ton. AHE (1)

Gold Ore from the Granada Gold Mines, Limited, Rouyn, Quebec. W. B. TIMM ET AL. *Can. Dept. Mines, Mines & Geol. Branch Rept.* No. 774, 1937, pp. 97-104. The ore, containing Au 1.05 and Ag 1.04 oz./ton, Cu 0.41, and As 0.80%, should be cyanided after removal of coarse Au by traps and blankets. **Gold Ore from Delnite Mines, Deloro Township, Cochrane District, Porcupine Area, Northern Ontario.** *Ibid.*, pp. 122-130. Maximum extraction of Au from this ore, assaying Au 0.53 and Ag 0.10 oz./ton, Cu 0.05, As 0.15, and S 2.13%, was obtained by cyanidation (95.3%); when followed by tabling of the tailing and regrinding and cyanidation of the concentrate, recovery is raised to 97.1%. Reagent consumption is normal. Flotation of ore 73-76% —200 mesh with regrinding and cyanidation of the concentrate gave 95.75% Au recovery; at 90% —200 mesh, recovery was 97.3%. **Gold Ore from the Morris Kirkland Mine in the East Kirkland Area, Lebel Township, Timiskaming County, Ontario.** *Ibid.*, pp. 131-134. The Au in this ore, assaying Au 0.25 and Ag 0.04 oz./ton, is very fine and requires fine grinding and long agitation. Cyanidation for 48 hrs. at 98% —200 mesh extracted 92% of the Au; tabling and regrinding sulfides increased this somewhat. Red Pb and high CaO are beneficial, Pb to precipitate sulfides dissolved by the high CaO. **Gold Ore from the Jowsey Island Gold Mines, Limited, God's Lake, Manitoba.** *Ibid.*, pp. 135-144. This ore, assaying Au 0.34 and Ag 0.07 oz./ton, is amenable to cyanidation and in spite of pyrrhotite no fouling occurred. Coarse Au should be recovered by jigs. At 59% —200 mesh, 78% of the Au was free milling. Amalgamation and cyanidation recovered 98.5% of the Au. **Gold Ore and Tailings from the Long Lake Property of the Lebel Oro Mines, Limited, Sudbury Mining District, Northern Ontario.** *Ibid.*, pp. 145-154. The ore, assaying Au 0.58 oz./ton and 0.07% As, should be cyanided after removal of coarse Au in traps or jigs. More than 60% of the Au can be recovered by amalgamation and 35% more by cyanidation. The tailing, assaying Au 0.185 oz./ton and 5.57% As must be washed, reground, aerated and cyanided to give 80% Au extraction. Reagent consumption is high. AHE (1)

Radium Recovery at Port Hope. M. POCHON (Eldorado Gold Mines) *Can. Chem. Met.*, Vol. 21, June 1937, pp. 211-213; *Chem. & Met.*, Vol. 44, July 1937, pp. 362-365. The process employed at Port Hope, Ont., is composed of 4 different operations housed in separate buildings: (1) the preparation of the minerals by roasting and milling, (2) the recovery of Ag and the reduction of the Ra into Ra-Ba-sulphate, (3) finishing of the Ra in the laboratory, and (4) refining of the U salts. Each operation is outlined. WHB + PRK (1)

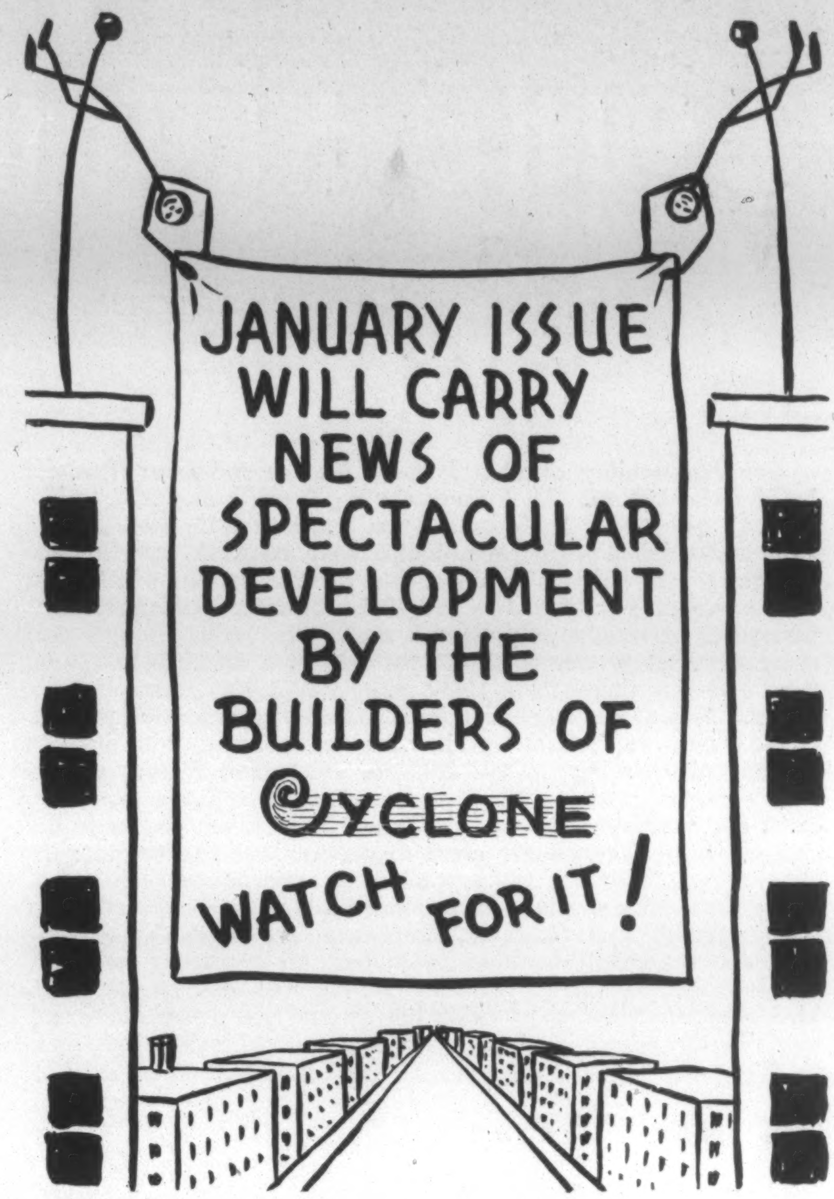
1a. Crushing, Grinding & Plant Handling

A Method for Estimating the Efficiency of Pulverizers. RAYMOND WILSON (Portland Cement Assoc.) *Mining Tech.*, Vol. 1, May 1937, T.P. 810, 15 pp. A special method for determining grindability of cement clinker is described. In this test a 1-g. portion of clinker 20 to 28 mesh is subjected to the impact of a falling ball received by a plunger. After crushing particle size is determined and surface area calculated. Application of test results to mill performance is described. JLG (1a)

Recovery of Potash from Tailing of a Porphyry Copper Property. G. L. OLDRIGHT, VIRGIL MILLER, HORST SIEG, W. E. KECK & F. K. SHELTON. *U. S. Bur. Mines, Rept. of Investigations* No. 3349, June 1937, 17 pp. Immense quantities of porphyry Cu tailings containing 5-10% K_2O, finely ground and easily and cheaply reclaimable, are available in the west. A process that recovers 90% of the K_2O in a 90% KCl product using cheap reagents is described. Tailings and NaCl are heated separately, mixed with coal in a soaking pit (800°), cooled to 400° in a closed container, to 200° in air, leached, KCl precipitated by cooling the liquors, and the crystals washed and dried. AHE (1a)

1c. Flotation

Use of Wetting Agents in Flotation. R. S. Dean, J. Bruce Clemmer & S. R. B. Cooke. *U. S. Bur. of Mines, Rept. Investigations* No. 3333, Feb. 1937, pp. 3-20. Wetting agents have a long hydrocarbon chain attached to a highly polar or hydrophile group in such manner that ionization is nearly complete in dilute solution and the resultant ionic grouping has a very considerable hydrophile-lipophile unbalance in the structure. As a result of this structure, these reagents are powerful frothers and emulsifiers. When the degree of hydrophile-lipophile unbalance is sufficiently great and specific chemical factors are absent, these compounds behave in flotation as noncollecting frothers insensitive to reasonable pH changes. Pure reagents of the wetting type have few collecting properties for sulfides or nonsulfides unless a small amount of an aliphatic acid, such as oleic, is added. In many cases, residual aliphatic acids in the reagents, or those resulting from hydrolysis of their solutions on standing, are sufficient to make the wetting agents selective collectors. These compounds are not affected by the soluble salts customarily found in flotation pulps. Wetting agents permit flotation with a minimum of collector, an advantage for separations in which mineral and gangue have the same order of floatability. Slight excess of these reagents gives voluminous froths, but these may be modified by lipophile substances without destroying selectivity. Choice of froth modifier depends on the frother employed; a proper balance of reagents gives a compact, heavily mineralized froth that is easy to handle. Results on flotation of barite, potash, NH_4Cl, borates, galena and sphalerite with various wetting agents and reagent combinations are reported. Wetting agents are powerful emulsifiers and will permit insoluble lipophilic substances to be used as collectors. Almost any lipophilic substance may be used if the proper wetting agent is selected. The theory of this flotation is discussed. Whether the coating be induced on a mineral by chemical reaction or by adsorption, it is formed because it represents a condition of minimum free energy. Wetting agents have been used as emulsifiers in the flotation of non-sulfides. Prior emulsification of the aliphatic acids increased their efficiency and permitted flotation at temperatures less than the freezing point of the acid. Emulsified collectors are particularly advantageous for flotation of minerals of near-colloidal size. Oxidized and nonsulfide minerals are more difficult to float with emulsions than are the sulfides and the emulsifier must have some specific collecting property for the mineral before successful flotation can be achieved. In general, there is little advantage in using emulsions of wetting agents that have a pronounced collecting property for a specific mineral; use of the wetting agent alone is sufficient. Emulsions of many mineral oils have been used successfully to float sulfides. Choice of the emulsifier is more important than choice of oil. Emulsions prepared from light oils were more effective than heavy-oil emulsions, but were less selective because of more voluminous froths. It is more difficult to prepare stable emulsions of light than of heavy oils and more emulsifier is required. The relative proportions of emulsifier, H_2O and oil, the kind of emulsifier and oil, the method of preparation, pH, and age of the emulsion affect its stability and the particle size of the dispersed phase. Oil-in-H_2O emulsions have little advantage over straight oil. Excess emulsifier promotes formation of H_2O-in-oil emulsions. Wetting agents are of 2 classes, represented typically by (1) the alkali metal salts of the higher alcohol sulfates or the long-chain aliphatic acids, which give large negatively charged ions, and (2) the heavily loaded quaternary ammonium salts, which give large positive ions. The sign of the charge on the dispersed lipophile phase is the same as that of the emulsifier. The size of the charge varies with the amount of emulsifier and tends to approach as a limit the electrokinetic potential of the emulsifier. Positively charged emulsifiers have a greater tendency to form H_2O-in-oil emulsions than do the negatively charged. As a rule, mineral particles in H_2O acquire a — charge, i.e., quartz, feldspar, barite, fluorspar, and calcite. Pure galena and sphalerite are practically neutral. Oxidized galena with an anchored Pb ions is +. Added substances, pH, and the physical state of the system modify the charge and may even reverse it. The charge on the large ions in various flotation reagents was determined by mixing them with colloidal AgI solutions of known charge and by electrophoretic measurement in a Mattson cell. Wetting agents that ionize to give a large + ion were effective flotation reagents for SiO_2 and conditions that gave good results on one ore were suitable for all tested. The quaternary NH_4 compounds with heavy + ions were the most effective collectors. Only 0.08 lb. of Emulsol 660-B/ton of material, when used with pine oil, gave complete recovery. Several negatively charged reagents, such as long-chain alkyl sulfates, were selective to barite. AHE (1c)



1e. Amalgamation, Cyanidation & Leaching

Gold Ore from the Bidgood Mine, Bidgood Kirkland Gold Mines, Limited, Lebel Township, Timiskaming County, Ontario. W. B. Timm et al. *Can. Dept. Mines, Mines & Geol. Branch Rept.* No. 774, 1937, pp. 105-121. The Au in this ore, assaying Au 0.69-1.07 and Ag 0.50 oz./ton, is very fine and intimately associated with both gangue and sulfide minerals. Recovery of more than 85-90% is impossible except by smelting. Cyanidation gives best treatment results. Long agitation, high CaO, and addition of Pb salts to precipitate sufides dissolved by high CaO are necessary. **Gold Ore from Bilmac Gold Mines, Macmurchy Township, West Shiningtree Area, Sudbury Mining Division, Northern Ontario.** *Ibid.*, pp. 155-161. Over 60% of the Au in this ore, assaying Au 0.49 and Ag 0.14 oz./ton, can be recovered by amalgamation and more than 35% more by cyanidation at 75-80% —200 mesh. AHE (1e)

New Methods for Obtaining Nickel from Frankenstein Nickel Ores (Neue Wege zur Gewinnung von Nickel aus den Frankensteiner Nickelerzen) V. Tafel & G. Lampe. *Metallwirtschaft,* Vol. 16, July 16, 1937, pp. 721-725. Practical. Results of experiments on the extraction of Ni from an ore (Ni content 1.83%) wherein the Ni was present chiefly as a Ni Mg silicate. The processes were direct solution in various media, treating the raw and reduced ore with chlorine gas, and finally treating the ore with sulphur dioxide in the presence and absence of air and in an O-enriched atmosphere. The most economical method of obtaining a Ni solution was to treat the ore with a mixture of roasting gases (SO_2) and O-enriched air. Ore treated in this manner would make a water solution containing 70% of the Ni. The solution so produced contains besides Ni, a small amount of Fe and considerable Mg. GA (1e)

Mining and Milling Methods and Costs at the Golden Messenger Mine of the United Gold Mines Corporation, York, Mont. S. H. Lorain. *U. S. Bur. Mines, Information Circ.* No. 6947, June 1937, 14 pp. The Golden Messenger ore is cyanided. From a 0.20 oz. head, a 0.02 oz. tailing is produced (90% extraction). Total costs are $1.21/ton. AHE (1e)

2·ORE REDUCTION

A. H. EMERY, SECTION EDITOR

Gas Penetrability of Blast Furnace Charge and Heat Transfer in Material Layers. M. SHAPOVALOV. *Teoria i Pract. Met.,* No. 3, 1937, pp. 3-13. In Russian. Ore fractions 0-12, 12-30, 30-60 mm. and coke in 40-70 mm. lumps were tested in a cylindrical refractory-lined shaft 1 m. diam. and 6 m. high into which blast at the rate of 3 $m.^3/m.^2$ was supplied. Resistance of ore to blast passage is inversely proportional to its size. Curves presented show 40 times greater resistance for 0-12 mm. ore than for 30-60 mm. and 7.5 times than 12-30 mm. Charging graded ores in separate layers was compared with mixed charging. With 50% of 0-12 mm. ore the same results were obtained both with separate and mixed charging. With 25% of 0-12 mm. fraction, about 20% greater resistance was observed with separate charging, resistance increasing linearly with the percentage of fine ore in the charge. Several curves are given to present heat penetration ratio of ore and limestone when used in samples of different size. When 80 x 80 mm. lumps of machined samples were heated in an electric furnace at 0-1100° C., temperature on the outside and inside was not equalized, even in 3 hrs. Heat transfer rate proposed by Furnas (see *Metals and Alloys,* Vol. 4, Sept. 1933, p. MA 302) was checked by using hot air and ore charge alone and was directly proportional to gas velocity instead of 0.7 thereof. (2)

2a. Non-Ferrous

Theory of Alumina-Cryolite Baths. I. TRUNEV. *Metallurg,* Vol. 12, Mar. 1937, pp. 112-117. In Russian. Under normal operating conditions Al ions are liberated at the cathode and Al_2O_3 decomposes together with a small amount of cryolite, the latter decomposition being caused by local overheating. Under these conditions the electrolytic decomposition of AlF_3 takes place leading to NaF concentration which increases power consumption by raising voltage by 0.1-0.3 volt. Precipitation of AlF_3 facilitates (1) F evolution caused by the lack of Al_2O_3 and (2) temperature increase around the anode produced by a higher voltage and thermal dissociation. In the transition period an unstable equilibrium is formed between AlF_3 and F liberation processes. When F ion liberation begins to predominate, the gas combines with C on the surface. A continuous coating of AlF_3 on the anode and of Na_3AlO_3 at the cathode is produced. A portion of AlF_3 is volatilized so that a certain increase of concentration of Na ions takes place at the cathode. (2a)

Foundry for Extraction of Copper from Ores and from Copper-bearing Residues and Refining of the Copper Obtained in Reverberatory Furnaces (Fonderia per l'estrazione del rame e dei residui cupriferi e raffinazione al forno a riverbero del rame greggio ottenuto) LUIGI STIAVELLI (Livorno Plant, Italian Met. Soc.) *Met. Ital.,* Vol. 29, June 1937, pp. 273-292. Review of familiar material. The operation of this refinery is given in detail. Italy is poor in Cu ores, those occuring are mostly chalcopyrites associated with pyrites. The slag produced is fused again and the melted $Cu_2S + FeS$ drawn off and further refined. AWC (2a)

Reduction of Nickel Oxides by Hydrogen. D. BOGATSKI. *Metallurg,* Vol. 12, Apr. 1937, pp. 58-65. In Russian. Thoroughly dried H_2 was passed over properly prepared Ni oxides heated to different temperatures, and then lead through a mixture of $KI + HgCl$, which was colored pink by the traces of H_2O vapors. The solid solution of Ni oxides begins to be reduced at 111°-112° C., but the temperature of the beginning of NiO reduction is 229°-230° C. A detailed study of the kinetics of reduction of solid solutions of Ni oxides is given. The reaction is completed in 2 hours at 700° C. and in 1 hr. at 800° C. (2a)

Reduction Equilibria of TiO_2 by H_2 NOBUYAKI NASU. *Science Repts. Tohoku Imp. Univ.,* Vol. 25, Nov. 1936, pp. 510-526. In English. Mathematical, plus original research. The equilibrium $TiO_2 — H_2 — Ti_2O_3 — H_2O$ was investigated between 749° and 1009° C. and various mathematical data calculated from the experimental results. BWG (2a)

An Advance in Zinc Smelting (Development of the Vertical Retort Process) E. H. BUNCE (N. J. Zinc Co.) *Metal Ind., London,* Vol. 50, Feb. 12, 1937, pp. 205-210. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 84R/9. RWB (2a)

The Extraction and Refining of Nickel. W. T. GRIFFITH (Mond Nickel Co.) *Metal Ind., London,* Vol. 50, Jan. 15, 1937, pp. 95-98. General review of familiar material. RWB (2a)

2b. Ferrous

Studies on the Acid Open-hearth Process (Färskningsförloppet vid den sura martinprocessen) BO KALLING & NILS RUDBERG. *Jernkontorets Ann.,* Vol. 121, Mar. 1937, pp. 93-141. Studies were made on various factors influencing the composition of steel before the final additions of Si and Mn in a number of open-hearth heats, worked with different decarburization velocities and slag compositions. With higher C contents, the O content was always low prior to addition and occasionally lower than in the finished steel. Undissolved oxide particles were present in small amounts only. Consequently the method of finishing the heat and the tapping and pouring conditions are believed to be mainly responsible for the slag content of the steel. The method of working the heat influences quality indirectly by affecting changes in the composition after adding deoxidizers and during tapping and pouring. A high velocity of decarburization does not raise the O content with high C content, and a vigorous boiling should be maintained during the early part of the heat by ore additions. This lowers the time of the heat and facilitates reduction of Si. At the end of the heat the rate of decarburization should be decreased so that the slag may become viscous enough to react slowly when additions are made. A high reduced Si content promotes viscosity. Increase of the Mn content or addition of lime may permit lowering of the FeO without detriment to the decarburizing action of the slag. The observed reactions between slag, steel and furnace lining were in good agreement with the equilibrium diagrams on slags saturated with silica. The reduced Si came from the lining, while oxidation of Si took place at the boundary between steel and slag. HCD (2b)

Study of Drop Formation Temperature of Primary Blast Furnace Slags. M. OSTROUKHOV. *Metallurg,* Vol. 12, Apr. 1937, pp. 80-90. In Russian. Diepschlag method was used and applied to a large number of samples belonging to SiO_2-Al_2O_3-CaO, CaO-SiO_2-$Fe_2O_3SiO_2$-Fe_2O_3 systems. See also *Metals and Alloys,* Vol. 8, June 1937, p. MA 340R/6. (2b)

Adapting the Operation of a Blast Furnace to its Construction Lines (Führung eines Hochofens in Anpassung au seine Profilgestaltung) J. STOECKER. *Stahl u. Eisen,* Vol. 57, May 13, 1937, pp. 545-552; May 20, pp. 581-584. The formation of loose and of closely packed layers in the blast furnace depends largely on the furnace profile, but for any profile the rate of gas flow must also be properly regulated to obtain the best efficiency. Ways of accomplishing this are discussed. SE (2b)

Blast-furnace Practice in France. F. CLERF. *Metals Tech.,* Vol. 4, Aug. 1937, T. P. 811, 20 pp.; *Iron & Coal Trades Rev.,* Vol. 135, Sept. 10, 1937, p. 396. Review. Gives details of blast furnaces and practice in France for smelting minette ores, and includes tables showing compositions of burden, slag, Fe, and gas. JLG + Ha (2b)

Electrical Cleaning of Blast Furnace Gas in East Moors near Cardiff (Die elektrische Gichtgasreinigung des Hochofenwerkes in East Moors bei Cardiff) K. GUTHMANN. *Stahl u. Eisen,* Vol. 57, Aug. 19, 1937, pp. 922-924. The 2-stage electrical precipitator with a capacity of 227,000 $m.^3/hr.$ is described. In the first dry stage the dust is electrically precipitated after cooling to 95° C. In the second stage the gas is moistened, cooled to 30° C., and the dust electrically precipitated, this also removing the moisture. SE (2b)

3 · MELTING, REFINING AND CASTING

G. L. CRAIG, SECTION EDITOR

Use of Compressed Air for Conveying and Compressing of Foundry Sands (Anwendung von Pressluft zum Fördern und zum Verdichten von Giessereisanden) FR. ROLFF. *Giesserei,* Vol. 24, July 16, 1937, pp. 368-371. Critical review. Ha (3)

Practical Notes for Moulders. J. PATTISON. *Foundry Trade J.,* Vol. 56, Apr. 8, 1937, pp. 291-292. Practical. Ramming the mold, venting, finishing the mold, core-prints, runner basins, etc. are discussed. AIK (3)

Mounting Patterns on Plate and Plaster. A. J. HINTON. *Foundry Trade J.,* Vol. 56, May 27, 1937, pp. 421-422. Practical. The essence of mounting patterns on plate or plaster is to provide a means whereby the pattern is held firmly during the ramming operation and to make the joint while ramming and not in a separate operation. The plate and pattern may be cast as a unit or the patterns may be mounted on a machined plate after machining them to conform to the plate. Flat-back patterns, a hand wheel pattern, plaster patterns, making a plaster match, chill making, ornamental castings, statuary castings, making a rope pulley and plaster mixtures are discussed. AIK (3)

Oil Cores and their Testing. H. NIPPER. *Foundry Trade J.,* Vol. 56, 1937, May 6, pp. 368-370; May 13, pp. 386-387. Comprehensive, up-to-date review. Influence of clay content, the oil binder, mixing properties of oil, drying and baking, thermal tests, permeability tests, abrasion tests, elevated temperature tests, gas evolution tests, core carriers and gas evolution, etc., are discussed. AIK (3)

Testing Foundry Sands. W. Y. BUCHANAN. *Foundry Trade J.,* Vol. 56, May 20, 1937, pp. 406-408, 414; May 27, pp. 423-425. Up-to-date review plus original research. The first part of this paper deals with the green-strength testing, penetration hardness tester, flowability, Dietert's hardness tester, hydraulic compression testing machine and index of ramming. The second part discusses expansion phenomena. Variation of density on dry-sand, expansion of green-sand, the influence of atmosphere, additions of coal-dust, clay, colbond, bentonite and sawdust, heat conductivity of sands etc., are discussed. AIK (3)

Mechanical Aids for Increasing Foundry Production. JAMES TIMBRELL. *Foundry Trade J.,* Vol. 56, Apr. 8, 1937, pp. 287-290, 292. Practical. Sand-preparing and handling plant in a continuous casting bay, roller conveyors used to line the sand belt with the casting rail, storage hopper for used sand, modern ladle, knock-out department with swivelling grate, etc., are discussed. AIK (3)

Testing Liquid Metal for Its Gas Content. V. DANILOV. *Metallurg,* Vol. 12, Apr. 1937, pp. 134-136. In Russian. In melting non-ferrous metals gas content is usually determined by pouring a chill and letting it solidify. In many occasions casting a chill gives quite satisfactory results, in others pouring a cake on steel plates gives more definite information. Examples are given of instances where these methods should be used. (3)

Lining of Casting Ladles (Le Garnissage des Poches de Coulée). A. GEOFFROY. *Rev. Fonderie Moderne,* Vol. 31, May 25, 1937, pp. 171-172. Procedure to line a ladle with sand described in detail. Ha (3)

Solidification of Ingots. C. H. DESCH. *Iron & Coal Trades Rev.,* Vol. 134, June 11, 1937, p. 1059; *Blast Furnace Steel Plant,* Vol. 25, May 1937, pp. 521, 534; *Engineer,* Vol. 163, May 14, 1937, p. 573. Descriptive. Solidification of an ingot and its effect on the properties of the forged or rolled material by the shape, arrangement and distribution of the crystals formed in solidification are discussed. Separation, segregation, pipe formation, and inverse segregation are described. Ha + MS + LFM (3)

3a. Non-Ferrous

Design of Castings of Electron Appropriate to the Properties of the Material (Werkstoffgerechter Entwurf von Gussstücken aus Elektronmetall) P. SPITALER. *Giesserei,* Vol. 24, July 30, 1937, pp. 389-396. In order to make the best use of the properties of light metals, in particular electron metal (sp. gr. 1.6), certain principles for casting in sand molds, chill molds and die castings were developed which take into account purpose of application, shape and heat-treatment. Tables show physical and mechanical properties for 10 different alloys, and most suitable application. The minimum wall thickness for electron castings in sand and chill mold should be 4 mm. for pieces of average size, 3 mm. for small pieces from a metal pattern. The wall thickness of die castings can be 1 mm. for normal pieces, 0.8 mm. for small, simple pieces. Very large areas should not be cast entirely horizontally. Walls of different thickness and accumulations of material are permissible only if it is possible to feed additional material through gates or risers to such places during solidification. A great number of practical hints for molding irregularly shaped pieces are given. Ha (3a)

Points of View for Selection and Production of Aluminum Casting Alloys (Gesichtspunkte bei der Wahl und Herstellung von Aluminiumgusslegierungen) A. v. ZEERLEDER. *Giesserei,* Vol. 24, June 18, 1937, pp. 317-319. Practical. The composition of a number of Al-Cu, Al-Zn-Cu, Al-Cu-Ni, Al-Si, Al-Si-Cu, Al-Si-Mg, Al-Mg, Al-Mg-Mn alloys that are well suited for casting, both in sand and chill mold, are given. If cast Fe crucibles are used instead of graphite, the former should be coated with a mixture of 50% clayey substance with at least 8% SiO_2, 45% H_2O and 5% sodium silicate. To avoid excessive gas absorption, the melt should never be heated above 800° C. Selection of alloy according to mechanical properties is discussed briefly. 10 references. Ha (3a)

Developments in Aluminum Production. GEORGE BOEX. *Metal Ind., London,* Vol. 50, Jan. 15, 1937, pp. 83-86. General. RWB (3a)

Metals of the Platinum Group. R. H. ATKINSON & A. R. RAPER (Mond Nickel Co.) *Metal Ind., London,* Vol. 50, Jan. 15, 1937, pp. 114-116. See *Metals and Alloys,* Vol. 8, Aug. 1937, p. MA 103L/6. RWB (3a)

Non-ferrous Foundry Problems. R. J. KEELEY. *Foundry Trade J.,* Vol. 56, May 27, 1937, pp. 431-432. See *Metals and Alloys,* Vol. 8, Oct. 1937, p. MA 606R/9. AIK (3a)

Furnaces for Aluminum Alloys. F. C. CASTLE. *Metal Ind., London,* Vol. 50, May 7, 1937, pp. 527-531. Practical. The relative merits of melting and heat treating light alloys in the electric furnace and the various types of furnaces used are discussed. The losses by burning with various melting methods are given as 1.5% in an oil-fired furnace, 1.2% in an electrically heated tank furnace and 0.8% in an induction furnace. The induction furnace has the added advantage of more uniform heat and the movement from the bottom to the top tends to drive impurities to the surface and has the effect of promoting degasification. For heat treating the proper uniformity of temperature can only be obtained in an "air-current heating" electrical furnace. RWB (3a)

Recommendation for Leaded Gunmetals. H. J. ROAST (Canadian Bronze Co.) *Metal Ind., London,* Vol. 50, Feb. 5, 1937, pp. 189-191. Original research. Comparison is made between a keel bar and a cast-to-size bar. The author states his preference for the keel bar, feeling it is best adapted for brass and bronzes, including Si, Al and Mn bronze. RWB (3a)

Admixtures in Silicon Bronzes and Brasses. A. P. SMIRYAGIN. *Tsvetnye Metal.*, No. 6, July 1936, pp. 101-114. Original research. The influence of various elements on the microstructure, physical, mechanical and casting properties of Cu-Si alloys were studied. Greatest plasticity was attained in alloys containing 3 to 3.5% Si, and greatest strength in alloys with 5 to 5.5% Si. The effect of various elements on the properties of the Cu-Si alloys, is as follows: Fe lowers the corrosion resistance, antifriction and mechanical properties and, therefore, is undesirable. Sn increases the hardness and decreases ductility and impact strength of the alloys, especially of brasses. Addition of Sn displaces the phase boundaries toward the Cu side, and causes the separation of eutectoid and γ phases. Consequently the Sn content should be limited to below 1%. Sb and As are harmful because they lower strength and toughness, cause the formation of eutectic veins in the interdendritic spaces, and of intercrystalline pores and fissures. Castings lose their soundness and often fail under hydrostatic test. P in amounts exceeding 0.5% decreases toughness because of the formation of low melting and brittle eutectic and β crystals. Ni, unless the castings are artificially aged, is also an injurious element as it decreases the impact resistance and ductility and increases the hardness. This shows that the effect of Ni on Si bronzes is opposite to that which it exerts on Sn bronzes and ordinary brasses. Al improves the mechanical properties and corrosion resistance of Si bronzes and brasses, but in small quantities causes the formation of Al_2O_3 films which lower the quality of the alloys, and therefore should be avoided. Pb was found to improve considerably the antifriction properties of the alloys. Mechanical properties of Si bronzes are, however, impaired, but still are better than those of Sn bronzes. Pb in amounts above 3% causes the formation of films, pores and intercrystalline fissures. The presence of the above metals in the Si bronzes and brasses in combinations of 2 or more is injurious because it tends to increase shrinkage, films, pores, and impair the mechanical properties. Particularly in the manufacture of steam and water line castings from Si brasses and bronzes (made by adding ferro-silicon and sand casting) it is necessary to avoid the following combinations: (1) Pb in bronzes with low Si content, (2) Al in presence of Pb, (3) Al in presence of Sn, (4) Al, Pb and Sn in all cases. 33 references. BND (3a)

Influence of Conditions of Solidification on the Macrostructure of Cast Metals. P. I. BARANOV. *Tsvetnye Metal.*, No. 7-8, Aug.-Sept. 1936, pp. 102-112. Studies the influence of the following factors on the macrostructure of cast Al: pouring temperature, rates of cooling, mechanical stirring, and rates of pouring. Al containing 0.1% Fe and 0.23% Si was cast into spherical Cu molds of 55 mm. diam. and 3 mm. wall thickness and also into cylindrical molds 60 mm. dia. and 240 mm. high. Samples cast at temperatures of 700° to 950° C. showed that the zone of columnar crystals and the grain size increased with rising casting temperatures. Casting at rates of cooling controlled so as to vary the time required for solidification from 1.11 to 0.13 min. showed that as the rate of cooling increased the grain became finer and the zone of columnar crystals decreased, almost disappearing with the fastest cooling rates used. Ingots cast into cylindrical molds made of cast Fe, Cu, a mixture of kaolin and asbestos, and into water cooled brass molds, showed the cast Fe molds to be superior to the others with respect to grain fineness, uniformity and soundness. Reheating cast Fe molds to temperatures up to 250° C. did not affect the macrostructure. Mechanical stirring during the solidification resulted in considerable grain refinement. The macrostructure was not affected by varying the speed of pouring from 9 to 54 sec. BND (3a)

Casting in Alpax the Basins of the "Tower of Snow" for the Paris Exposition (La Coulée en Alpax des Vasques de la "Tour de Neige" du Palais du Froid de l'Exposition) *Rev. Aluminium*, Vol. 14, May 1937, pp. 703-706. Illustrated description. Total weight of Alpax (Al-Si) 15 tons, with 64 sand cast parts of 235 kg. each. HR (3a)

How to Imbed Metal Parts in Die Castings (Wie bettet man Metallteile in Spritzguss ein?) A. MAYERHOFER. *Werkst. u. Betrieb*, Vol. 70, July 1937, pp. 178-179. Practical. HR (3a)

Porosity of Die Castings and its Elimination. V. PLATSKI. *Liteinoe Delo*, Vol. 8, No. 5-6, 1937. In Russian. General. (3a)

Causes of Porosity of Brass Die Castings. P. POLYAKOV. *Liteinoe Delo*, Vol. 8, No. 5-6, pp. 26-28. In Russian. General considerations. (3a)

Technical Aspects of Chill Casting Aluminum Alloys. V. RODYUSHKIN. *Liteinoe Delo*, Vol. 8, No. 4, 1937, pp. 46-50. In Russian. General. (3a)

Die-castings in Automobile Production. C. R. MAXON (N. J. Zinc Co.) *Metal Ind., London*, Vol. 50, May 14, 1937, pp. 553-554; *Steel*, Vol. 100, Apr. 19, 1937, pp. 40-44; May 3, 1937, pp. 46-48, 50, 96; May 17, 1937, pp. 43-44, 46. Description of the current practice (U.S.A.) in the application of die-castings in automobile manufacture, and the factors involved in the choice of die-cast components against competitive materials and fabricating methods. Zn base die-castings should not be used long above 150° C., or in continuous or prolonged use in contact with hot water or steam. RWB + MS (3a)

Deoxidation of Ni and Ni-Cu Alloys. H. NISHIMURA, M. MORINAGA & T. IKEDA. *Suiyokwai-Shi*, Vol. 9, June, 1937, pp. 251-255. Original research. If molten Ni and Ni-Cu alloys absorb O their fluidity is much decreased: hence they must always be deoxidized with Mg before casting. Oxidized Ni and Ni-Cu alloys were analyzed by H reduction method, and their microstructures examined. The Ni-NiO eutectic was found at 1.1% O, as previously reported by Merica and Waltenberg. Molten Ni did not dissolve more oxygen but the mixture separated into 2 layers. When Ni was added to Cu containing Cu_2O, the $Cu-Cu_2O$ eutectic was displaced considerably to the Cu side. The poor fluidity of Ni-Cu alloy that had absorbed O was ascribed to the primary separation of oxide (probably a mixture of Cu_2O and NiO). Industrial Ni-Cu alloys such as Monel metal and Cupronickel contained about 0.02% of O, and even when Mg was added as a deoxidizer, this amount of O always remained in the alloys. HN (3a)

The Production of Magnesium. *Metal Ind., London*, Vol. 50, Jan. 15, 1937, pp. 99-104. General. The electrolytic extraction method has found greater application for extracting Mg although several thermal processes have recently been perfected to a promising extent. RWB (3a)

Developments in Lead Smelting. W. T. BUTCHER. *Metal Ind., London*, Vol. 50, Jan. 15, 1937, pp. 105-110. General. A description of the Newman hearth which is displacing the Scotch hearth is given. The refining process is discussed in a general way. RWB (3a)

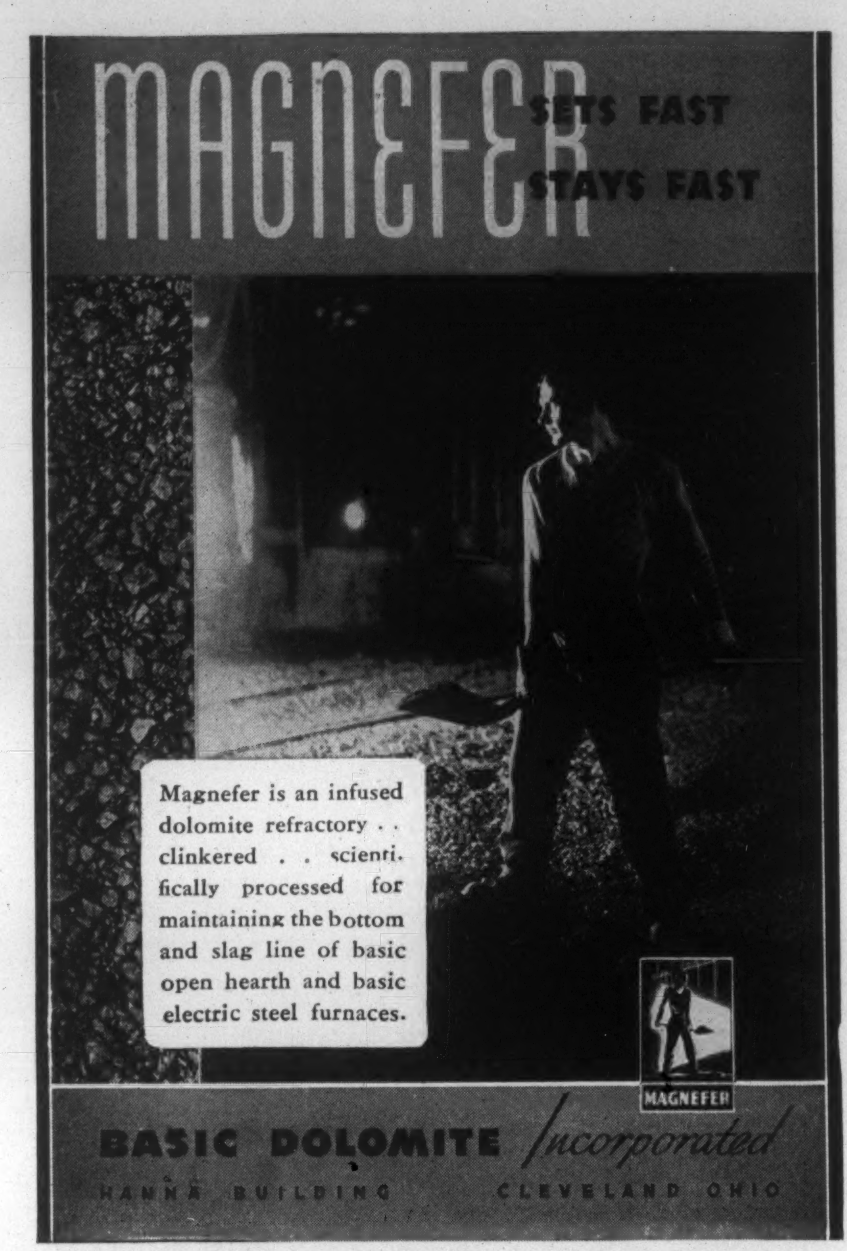
3b. Ferrous

C. H. HERTY, SECTION EDITOR

Seventh Report on the Heterogeneity of Steel Ingots. *Iron Steel Inst.*, Special Report No. 16, 1937, 238 pp.; *Engineering*, Vol. 143, May 7, 1937, pp. 539-540; May 14, 1937, p. 559. Original research. Section I reviews some work of the Committee. Section II, by T. SWINDEN, gives results of studies on composition of different parts of rimmed ingots. Section IIIA, by J. H. WHITELEY, describes results of study on inclusions in electric-furnace steel during progress of heat. Section IIIB, by T. RAINE & J. B. VICKERS, gives O determinations on a series of bath samples from an electric furnace. Section IV is a report by the Oxygen Sub-committee. A vacuum-fusion method is described by W. W. STEVENSON & G. E. SPEIGHT. Improvements in the vacuum-fusion apparatus at the National Physical Lab. are described by H. A. SLOMAN. Another vacuum-fusion apparatus is described by T. RAINE & J. B. VICKERS. An alcoholic I method is described by T. E. ROONEY, W. W. STEVENSON & T. RAINE. A Cl method is described by E. W. COLBECK, S. W. CRAVEN & W. MURRAY. Section V, by T. SWINDEN & W. W. STEVENSON, gives further experiments on gases in Fe and steel and their effect on solidification of ingots. Section VI is a report of the Ingot Moulds Subcommittee. The committee reports on factors influencing mold life, determination of relative importance of conditions affecting mold life, and correlation of ingot-mold data. J. G. PEARCE discusses failure of ingot molds, and the influence of composition and structure. A bibliography of 104 references to ingot molds is given. Section VII is a report of the Liquid Steel Temperature Sub-committee. A report on the "quick immersion" method of temperature measurement is given by F. H. SCHOFIELD. The production of refractory tubes for immersion in liquid steel is described by VAUGHAN H. SCOTT. JLG + LFM (3b)

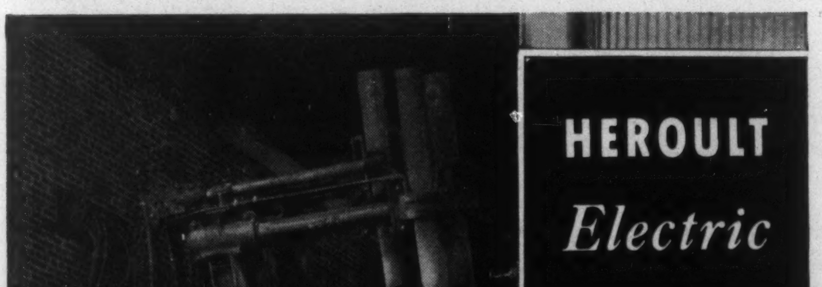
Metallurgical Study of a Mixer. L. VLADIMIROV & M. SPIRIDONOV. *Metallurg*, Vol. 12, Mar. 1937, pp. 22-37. In Russian. Study of a modern 1200 ton mixer covering a period of 7 months. Average metal composition was reduced to a narrower range as compared with blast furnace metal. C variations were changed from 0.80 to 0.57%, Mn from 0.5-2.5 to 1.1-2.1% S from 0.03-0.09 to 0.35-0.065%; Si and P were practically unaffected. Factors affecting the composition are described. Figures are appended showing elimination of different alloying elements in the mixer. Methods for operating mixers are fully discussed. (3b)

Ohio Ferro-Alloys Corporation
Canton, Ohio



Magnefer is an infused dolomite refractory . . clinkered . . scientifically processed for maintaining the bottom and slag line of basic open hearth and basic electric steel furnaces.

BASIC DOLOMITE *Incorporated*
HANNA BUILDING CLEVELAND OHIO



New type-1½. Floor attached to shell, tilts with furnace.

USE them for efficient melting and refining of all kinds of ferrous materials by either basic or acid process—including alloy, tool and forging steels, iron and steel castings. Any capacity from ½ ton to 100 tons; removable roof, chute, machine or hand charging.

AMERICAN BRIDGE COMPANY
General Offices: *Pittsburgh, Pa.*
Offices in the larger cities
Columbia Steel Co., San Francisco, *Pacific Coast Distributors*
United States Steel Products Co., New York, *Export Distributors*

UNITED STATES STEEL

Gates and Risers for Steel Castings. A. D. KIRBY. *Foundry Trade J.*, Vol. 56, Apr. 15, 1937, pp. 311-312. A paper read before the Scottish Branch of the Inst. Brit. Foundrymen. Review plus original research. Mold and core preparation, blank ring castings, a brake drum casting, heads on risers are discussed. The future success of mold facings must be in the application of an oil sprayed on the mold, which produces surface hardness and does not impair the permeability to any extent. The type of in-gate which gradually increases in size from the down-gate to casting is condemned. Steel that "runs like water" is more apparent than real. Even if steel leaves ladle like water, it soon loses its life when it comes in contact with the mold face and the atmosphere. Gradual reduction of the area of the in-gate does not increase the velocity when employing a number of in-gates, for the total area of the in-gates is relative to the area of the down-gate. The frictional resistance set up by a number of small in-gates must impede the progress of the steel. One important feature in favor of a number of in-gates is that local heating of the mold is reduced proportionately to the number of gates employed. Certain jobs are not affected adversely by using only one in-gate but quite a number of jobs which are cast with only one in-gate could be improved by the application of a number of in-gates. AIK (3b)

Runners and Risers for Gray Iron Castings. JOHN LONGDEN. *Foundry Trade J.*, Vol. 56, Apr. 1, 1937, pp. 269-273. A paper read before the Scottish Branch of the Inst. British Foundrymen. Practical. The runner arrangements for gray Fe castings must be related to certain elementary and important principles. For work of importance, the runner basin should have a capacity of at least 400 cub. in. for each sq. in. of cross-sectional area of the down-gate. Factors influencing the speed and completeness with which molten gray Fe fills a mold are: (1) its pouring temperature; (2) the velocity attained in descending the down-gate; (3) the degree of frictional resistance set up by the walls of the mold, and (4) the degree of freedom from change in the direction of travel. Combination drop gate and joint spray, pipe and cylinder castings, heavy cylinder practice, roller castings, slow pouring conditions, function of a riser, rod-feeding, etc., are discussed. Paper is illustrated with a number of sketches. AIK (3b)

The Manufacture of Iron and Steel Castings in Green Sand. C. J. DADSWELL, T. R. WALKER & F. WHITEHOUSE. *Foundry Trade J.*, Vol. 56, Apr. 22, 1937, pp. 329-333. Practical discussion. Advantages and disadvantages of green sand molding, sand practice, green sand cores, properties of steel in relation to green sand, sand control, synthetic sands, type of steel castings made, green sand Fe castings, core irons, etc., are discussed. Successful production of some types of steel castings is more easily accomplished in green sand; with other types green sand presents difficulties. The technique of making green sand steel castings up to about 1 ton each in weight is still not generally known, although the number of steel foundries now making small green sand castings is rapidly increasing. Small castings suitable for repetition work lend themselves particularly well to green sand production in the steel foundry. Examples are castings for railway locomotives, carriages and wagons and castings for motor cars. AIK (3b)

Oxides in Basic Pig Iron and in Basic Open-hearth Steel. T. L. JOSEPH (U. S. Bureau of Mines) *Metals Tech.*, Vol. 4, June 1937, T. P. 804, 40 pp. Research. Difficulties in making clean steel have been attributed to cold or dirty Fe. No relation was found between blast-furnace practice and the amount of oxides in several hundred consecutive casts. The electrolytic extraction method was used for determination of oxides in the Fe. A definite relation between Si and S in pig Fe was established but no relation was found between oxides in the Fe and temperature of the cast. It is concluded that the Fe used has little, if any, effect on the cleanliness of the steel. JLG (3b)

The Freezing of Cast Iron. ALFRED BOYLES. *Foundry Trade J.*, Vol. 56, Apr. 22, 1937, pp. 335-336; *Metal Treatment*, Vol. 3, Summer 1937, pp. 84-85. See *Metals and Alloys*, Vol. 8, Aug. 1937, p. MA 500L/2. AIK + JCC (3b)

Production of Some Iron Castings for Steel Works. J. ROXBURGH. *Foundry Trade J.*, Vol. 56, May 20, 1937, pp. 409-414. See *Metals and Alloys*, Vol. 8, Oct. 1937, p. MA 607L/10. AIK (3b)

Heredity of Blast Furnace Irons. E. SHVEDENKO. *Liteinoe Delo*, Vol. 8, No. 3, 1937, pp. 15-19. In Russian. Large amount of scrap caused by the presence of porous areas near the grooves in tractor pistons was attributed to the use of high Si Fe in the charge. This Fe has inherently more graphite precipitation which shows itself in graphitic accumulations. Replacement of 20% of the charge consisting of 3.25% Si iron with the same amount of iron carrying 2.31% Si eliminated the trouble. (3b)

Counter Gravity Die Casting of High Melting Point Metals. Samuel P. Wetherill. *J. Franklin Inst.,* Vol. 224, Aug. 1937, pp. 153-190. Descriptive. Die castings of grey Fe are made by forcing the molten metal under pressure into the bottom of an Fe mold. Timed removal of the hot casting helps prevent injury to the mold. FHC (3b)

Hydrogen Permeability and Decarburization of Cast Iron (Wasserstoffdurchlassigkeit und-Entkohlung von Gusseisen) W. Baukloh &. F. Springorum (Tech. Hochschule, Berlin) *Metallwirtschaft,* Vol. 16, May 7, 1937, pp. 446-449. Research. The H-permeability of cast Fe is a function of the amount and manner of distribution of graphite present. Except for white cast Fe, the diffusion of H through the graphite containing voids rather than the metal lattice is the controlling factor as is shown by the fact that there is no apparent break in the permeability-temperature curve corresponding to α-γ transformation. Decarburization of cast Fe by hydrogen increases with increasing H-permeability. By calorizing it was possible to treat a cast Fe pipe so that it would hold H for a relatively short time. GA (3b)

Cast Milling Cutters. S. Kazeev & L. Ermoshkin. *Metallurg,* Vol. 12, Feb. 1937, pp. 78-85. In Russian. Practical. Milling cutters were cast of several high speed steels. Casting procedure is described in detail. Castings were heated to 800-850° C. at 50°/hr., held for one hr.; heated to 1150° C., held for 1½-2 hrs., slowly cooled to 300° C. soaked there for one hr., heated to 850° C., held for 2 hrs. and cooled at 20-30° C./hr. After machining, the cutters were quenched at temperatures required by their composition. Finished cutters were tested for cutting properties using ample lubrication and characteristics compared with cutting properties of forged cutters. Satisfactory results were obtained, the best for cutter containing 0.72% C, 4.6 Cr, 19.39 W, 0.36 V, which was quenched from 1280-1300° C. (3b)

Non-metallic Inclusions in Steel. R. Graham & R. Hay. *Foundry Trade J.,* Vol. 56, Apr. 22, 1937, p. 334. See *Metals and Alloys,* Vol. 8, Sept. 1937, p. MA 572R/1. AIK (3b)

Refining Cast Iron, High Carbon Steel and Ferromanganese for Acid Heats. G. Sakharov. *Metallurg,* Vol. 12, Apr. 1937, pp. 66-70. In Russian. Practical. Conditions which should be observed during dephosphorizing treatment are enumerated. (3b)

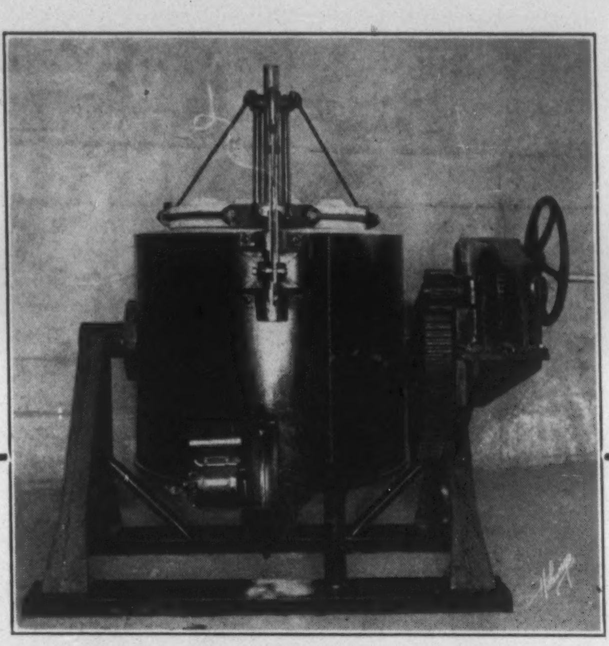
Production of Alloyed Ingot Iron. M. Gershgorn (Ukrainian Inst. Metals) *Stal,* Vol. 6, Aug. 1936, pp. 10-21. In Russian. Practical. A description of experimental heats of ingot Fe containing 0.05% C, 0.08% Mn, 0.08% Si, 0.02% S, 0.01% P, 0.10% Mo, and 0.24% Cu. The slag was deoxidized with 70% ferro-silicon and the metal with 70% ferro-silicon and Al. After rolling, the Fe had a tensile strength of 49,000 lbs./in.,^{2} elongation of 36% and a reduction of area of 79.4%. Analysis showed 0.032% O_2 and 0.0675% slag inclusions. HWR (3b)

Some Factors Influencing Segregation and Solidification in Steel Ingots. Leon H. Nelson (Republic Steel Corp.) *Metals Tech.,* Vol. 4, Apr. 1937, T.P. 802, 7 pp. Practical. Information is given on influence of pouring temperature, hot-top volume, and pouring rate on C segregation in killed ingots of S.A.E. 1040 steel. Segregation of Mn, P, S, Si and Ni is briefly discussed. It is important that killed ingots not be moved before they are completely solidified. JLG (3b)

Cast Steel from the Rotating Furnace Heated with Pulverized Coal (L'Acier Moulé au Four Rotatif à Charbon Pulverisé) A. Guédras. *Rev. Fonderie Moderne,* Vol. 31, Apr. 1937, pp. 123-128. Descriptive. The rotating furnace with pulverized coal firing is considered superior to the open-hearth. Only 4% loss by burning against about 20% in a converter is claimed. The C content can be held to within .01% of the desired value; the mixture of the charge is calculated from the scrap used and ore is added as required. The steel is cast between 1750° and 1580° C. A complete process is described in detail for a furnace of 5000 kg. Ha (3b)

Influence of Sulphide Inclusions on Mechanical Properties and Structure of Bessemer Steels. S. Skorodzievski. *Metallurg,* Vol. 12, Mar. 1937, pp. 15-21. In Russian. A study of a large number of baby Bessemer blows associates the drop of elongation and development of banding with the presence of increased amounts of MnS inclusions. (3b)

Founding of Pressure Castings. H. H. Judson (Gould Pumps, Inc.). *Can. Chem. Met.,* Vol. 21, June 1937, pp. 222-224. Practical review. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 70L/7. WHB (3b)



WALKER-YORK
CRUCIBLE FURNACES
(COKE-FIRED ONLY)

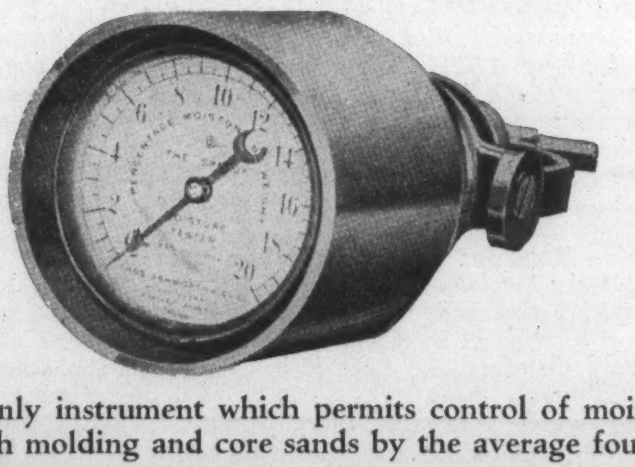
Economical—Flexible—Adaptable—Self-Contained.
This furnace produces good metal at low cost.

Made both tilting and stationary in sizes taking
#40 to #400 crucibles.

Larger sizes made to order.

CRUCIBLE FURNACE CO., INC.
CHARLOTTESVILLE, VIRGINIA.

Use the "SPEEDY"
MOISTURE TESTER



The only instrument which permits control of moisture in both molding and core sands by the average foundry laborer.

Enables you to ascertain moisture content of sand in a few moments. If the moisture content of your sand is required, you cannot do without this simple instrument to ascertain moisture at the sand pile. Ask for further particulars.

The Alpha Lux Co., Inc.
192 FRONT ST. NEW YORK

4 · WORKING

The Effect of Plastic Deformation on the Transformation Speed of Polymorphous Metals II. The Effect of Metallic Impurities I (Dor Einfluss mechanischer Deformation auf die Umwandlunsgsgeschwindkeit polymorpher Metalle II. Der Einfluss metallischer Beimengungen I) Ernst Cohen & A. K. W. A. van Lieshout (van't Hoff Lab.) *Proc. Koninkl. Akad. Wetenschappen Amsterdam,* Vol. 39, No. 3, 1936, pp. 352-358. In German. Original research. The effect of contaminations upon the transformation velocity of white Sn of known physical and thermal pretreatment was investigated. Traces of Pb, Sb, Bi, Cd, or Ag lower and Zn or Al enormously accelerate the phase change. A maximum transformation speed was found when adding 0.05% Zn. **The Effect of Metallic Impurities II (Der Einfluss metallischer Beimengungen II)** Ibid. No. 10, 1936, pp. 1174-1179. In German. Original research. Traces of Zn, Co, Mn, Al and Te increase the transformation speed of white Sn; Fe, Ni and Cu are practically indifferent, while Bi, Sb, Pb, Cd, Au and Ag lower it. The addition of several elements, as for instance, Al and Bi in equal amounts, suppresses the accelerating action of one (Al) by the retarding effect of the other (Bi). The effect of contaminations was observed on cast Sn. EF (4)

4a. Rolling

S. EPSTEIN, SECTION EDITOR

Cutting Efficiency of Turning Tools as Indicated by Tool Life vs. Cutting Temperature Curves (Kennzeichnung der Schnittleistung von Drehmeisseln durch Standzeit-Schnittemperatur-Kurven) H. Schallbroch & H. Schaumann. *Stahl u. Eisen,* Vol. 29, Apr. 1937, pp. 441-444. See *Metals and Alloys,* Vol. 8, Sept. 1937, p. MA 545R/7. SE (4a)

Phenomena of Flattening (Cold Rolling) Steel Wire. M. Zlotnikov. *Metallurg,* Vol. 12, Mar. 1937, pp. 47-61. In Russian. Mathematical study of the processes taking place during rolling round wire into flat sections. A nomogram for determining diameters of wire required for given section is given. (4a)

Flow of Materials in Rolling and the Analogy between Rolling and Pressing (Materialflytningen vid valsning och stukning) H. Unckel. *Tek. Tid.,* Vol. 67, Mar. 13, 1937 (Section *Bergsvetenskap*) pp. 17-21. The deformations which take place in rolling and pressing are shown by photographs and diagrams. The two procedures are practically analogous as far as the forces exerted and the progress of deformation are concerned, the only real difference being that the working surfaces in rolling are not parallel to each other. BHS (4a)

Sleeve Rolls for Heavy Reduction Cold Mills. W. Trinks. *Metal Ind., London,* Vol. 51, July 30, 1937, p. 110. Practical. The thicker the shell, the less is it influenced by the high local stress at junction of shell and core, the less sensitive to rapid heating, and, therefore, the safer it is. Shrink fits hold better than press. Properly made rolls do away with dinner plate spalling, but are subject to corner spalling. Corner spalling cannot always be blamed on defects of rolls but may be caused either by insufficient hardness of working roll or by improper operation of mill. RWB (4a)

Bearings for Rolling Mills and the Prohibited Use of Base Metals (Lager für Walzwerke und Rollgänge in N.E.M.-Walzwerke und das Verwendungs-Verbot für alle unedlen Metalle) L. Weiss. *Metallwirtschaft,* Vol. 16, Aug. 27, 1937, pp. 879-884. Practical. The substitution of non-metallic bearings in rod mills is discussed. Pockwood and artificial rosin bearings have proved feasible but require careful attention. The difficulties of replacing the bronze bearings in hot and cold rolling sheet mills is much greater than in the rod mills because of the greater bearing pressure. An appendix is included wherein is described a method for calculating roll pressure and bearing load, for both hot and cold rolling, from the flow curve of the material being rolled. Enough data are presented so that this calculation can be carried out for most of the common metals. GA (4a)

New Continuous Rod Mills, American Steel & Wire Co. at Joliet, Ill. *Wire & Wire Prod.,* Vol. 12, Aug. 1937, pp. 401-405, 448; *Ind. Heating,* Vol. 4, Sept. 1937, pp. 738-742. Detailed description of equipment, arrangement, speed of rolling, material used for wire-drawing, furnaces, conveyors, oiling system, water supply, and noise abatement. Ha (4a)

Roll Neck Bearing of Wood and Synthetic Resin (Walzenlagerung in Holz und Kunstharz) H. Cramer. *Stahl u. Eisen,* Vol. 57, Apr. 29, 1937, pp. 437-441. Types of wood and synthetic bearings which worked very successfully are illustrated. SE (4a)

Hot-rolling Tests with Plain Carbon and High-alloy Steels under Different Rolling Conditions (Warmwalzversuche an unlegierten und hochlegierten Stählen bei verschiedenen Walzbedingungen) G. Weddige. *Stahl u. Eisen,* Vol. 57, Aug 19, 1937, pp. 913-921. See *Metals and Alloys,* Vol. 8, Aug. 1937, p. MA 481R/2. SE (4a)

Problems in Rolling Shapes (Aufgaben auf dem Gebiete der Formgebung) H. Sedlaczek. *Stahl u. Eisen,* Vol. 57, June 24, 1937, pp. 702-704. General. (4a)

New Two-high Reversing Universal Rolling Mill (Neues Duo-Umkehr-Universalwalzwerk) R. Heifer. *Stahl u. Eisen,* Vol. 57, Apr. 15. 1937, pp. 398-400. Layout is described. The annual capacity is 140,000-200,000 tons of slabs. SE (4a)

Resistance of Alclad to Deformations in Rolling. Ya. Gallay &. N. Get. *Metallurg,* Vol. 12, Apr. 1937, pp. 115-121. In Russian. Question was investigated from the mechanical standpoint. (4a)

4b. Forging & Extruding

A. W. DEMMLER, SECTION EDITOR

Cold Extrusion of Aluminum and Copper. D. K. Crampton (Chase Brass and Copper Co.) *Metal Ind., London,* Vol. 50, Feb. 19, 1937, pp. 235-236. Practical. The Hooker and impact extrusion processes are discussed. RWB (4b)

Forging Monel Metal, Nickel and Inconel. F. P. Huston (Intern. Nickel Co.) *Metal Ind., London,* Vol. 50, Feb. 19, 1937, pp. 231-234. See *Metals and Alloys,* Vol. 8, May 1937, p. MA 273L/8. RWB (4b)

Speed of Heating Alloy Steels. E. A. Klausting. *Metallurg,* Vol. 12, Feb. 1937, pp. 31-42. In Russian. Factors involved in heating and a series of heating experiments are described. Ingots of alloy steels having different composition were charged at different temperatures and heated at different rates to find temperatures and rates which will not produce any troubles on forging a given type of steel. All conclusions were based on the presence or absence of visible cracks in forging, without paying any attention to internal fissures. (4b)

A 100-inch Semi-continuous Sheared Plate Mill, The Homestead Plant of the Carnegie-Illinois Steel Co. *Iron & Steel Ind.,* Vol. 10, Mar. 1937, pp. 297-303. Description of plate mill with an estimated capacity of 729,000 tons per year of plates up to ⅝ in. thickness. CEJ (4b)

Extruded Pipes, Round and Profiled Bars of Non-ferrous Metals (Gepresste Rohre, Rund- und Formstäbe aus Nichteisenmetallen) E. Trebesius. *Aluminium,* Vol. 19, July 1937, pp. 475-477. The principle of the process and machine construction are described. The special advantage over other methods is less waste. Ha (4b)

Roll Pass and Mandrel Design for Rockright Mills. P. Emel'yanenko. *Metallurg,* Vol. 12, Apr. 1937, pp. 104-114. In Russian. Mathematical development of the proper design. (4b)

4c. Cold Working Shearing, Punching, Drawing & Stamping

Effect of the Stress-strain Curve on the Blanking Properties of Mild Steel. J. D. JEVONS. *Sheet Metal Ind.*, Vol. 11, June 1937, pp. 547-548. Practical application of tensile data to a blanking and drawing problem. Burrs thrown on blanks were a cause of difficulty. The only property in which good and bad steels differed was their proportional limit. Good blanking occurred when a definite and fairly high limit existed. AWM (4c)

New Double-pointed Vertically Cast Wire Bar. F. BENARD (Ontario Refining Co.) *Wire & Wire Prod.*, Vol. 12, Sept. 1937, pp. 491, 495. A machine is described for machining a nose on both ends of a vertically cast Cu bar to facilitate rolling of fine wires. Ha (4c)

Production of Ornamental Stampings. *Metal Ind., London*, Vol. 50, Feb. 12, 1937, pp. 211-212. General description of the manufacture of Ni silver buttons and badges. RWB (4c)

Recent Progress in Cold-heading Machinery. R. H. JONES (Natl. Machinery Co.) *Wire & Wire Prod.*, Vol. 12, Sept. 1937, pp. 479, 482-483, 501. Review of improvements in construction and design. Ha (4c)

Cold-finishing Bar Steel. E. J. KNOPF (Union Drawn Steel Co.) *Wire & Wire Prod.*, Vol. 12, Aug. 1937, pp. 419, 422-428. A brief history of cold-drawing steel and its advantages over hot-rolling is given; the process and machinery used are described in detail. Ha (4c)

Modern Cold Heading Practice. ROY H. SMITH (Lamson and Sessions Co.) *Metal Ind., London*, Vol. 50, May 21, 1937, pp. 576-577. See *Metals and Alloys*, Vol. 8, Oct. 1937, p. MA 610L/8. RWB (4c)

Cold Heading Problems. C. L. HARVEY. *Wire & Wire Products*, Vol. 12, July 1937, pp. 359-361, 383. The required properties of steel used for this process, dies, processes for cold heading and heat treating of the material are discussed in general. See also *Metals and Alloys*, Vol. 5, Nov. 1934, p. MA 515. Ha (4c)

4d. Machining

H. W. GRAHAM, SECTION EDITOR

Turnability of Light Metals (Drehbarkeit von Leichtmetallen) A. WALLICHS. *Z. Ver. deut. Ing.*, Vol. 81, Apr. 17, 1937, pp. 457-458. Original research. Experiments on the behavior of 36 light metal alloys were made and tables and diagrams developed showing the relation between time required for turning at different turning velocities, shapes of tools, cooling agents and feeds. A systematic relation was found for time and cutting velocity, but the physical properties did not permit of conclusions as to turnability. Ha (4d)

Abrasive Cutting Off. *Automobile Engr.*, Vol. 27, Jan. 1937, pp. 18-19. Descriptive. Economical procedure in cutting with abrasives is discussed, and correct and incorrect methods of cutting section stock are shown. The best surface speed for bakelite-bonded wheels is 15,000-16,000 ft./min.; rubber-bonded wheels may safely be run at about 8,000 ft./min. Ha (4d)

Machining Aero-engine Valves. Methods Employed by Armstrong Siddeley Motors Ltd. *Machinery, London*, Vol. 50, July 22, 1937, pp. 505-509. Descriptive. JZB (4d)

Maintenance of Cutters for Engraving Machines. *Machinery, London*, Vol. 50, July 22, 1937, pp. 510-511. Practical. Types of tools and cutting conditions recommended for engraving machines. JZB (4d)

Machining the Copper Band on an 8" Projectile. *Machinery, London*, Vol. 50, July 22, 1937, p. 519. Descriptive. JZB (4d)

Cutting Properties of Metals. O. W. BOSTON (Univ. Mich.) *Metal Ind., London*, Vol. 50, May 28, 1937, pp. 601-602; *Engineer*, Vol. 163, May 28, 1937, pp. 631-632; *Metal Treatment*, Vol. 3, Summer 1937, pp. 75-76. See *Metals and Alloys*, Vol. 8, Aug. 1937, p. MA 482R/10. RWB + LFM + JCC (4d)

Machining Aero Engine Cylinder Barrels. *Machinery, London*, Vol. 50, July 15, 1937, pp. 477-481. Descriptive. Details of machining operation from a forging of 0.55% C steel. JZB (4d)

STEWART

INDUSTRIAL FURNACES of all kinds

FORGING, HEAT TREATING, METAL MELTING, ETC.

●

CAR TYPE FURNACES, CONVEYOR FURNACES and the STEWART GASIFIER

●

A Stewart representative is located near you. Let us know and we will see that he gets in touch with you quickly.

CHICAGO FLEXIBLE SHAFT CO.
1103 South Central Avenue, Chicago, U. S. A.
FLEXIBLE SHAFT CO., Ltd., 321 Weston Rd., S., Toronto, Ontario, Can.
Eastern Branch Office: 11 W. 42nd St., New York, N. Y.

INSULBRIX

Lined Forge Furnace Heats Up in 35 Minutes

Manufacturer used:

INSULBRIX 3000 to line a 6' x 6' x 11' furnace handling billets 36" diam. x 18' long. Heating time from cold start cut to 35 minutes. No spalling or slagging of the brick, with furnace greatly abused by operators due to its flexibility.

INSULBRIX—light weight, low heat storage insulating fire bricks for temperatures up to 3000° F.—help manufactures cut costs.

Write for New Bulletin 198 MA

OTHER QUIGLEY PRODUCTS: SPECIFICATION FIRE BRICK · HYTEMPITE · INSULBLOX · INSULAG · INSULCRETE · Q-CHROME · HEARTH-CRETE · CAST-REFRACT · TRIPLE-A PROTECTIVE COATINGS · ACID-PROOF CEMENTS · Q-SEAL · Q-CHROMASTIC · DAMIT · *ANNITE*

QUIGLEY COMPANY, INC.
56 W. 45th Street, New York, N. Y.
Makers of HYTEMPITE, *"The World's Standard High Temperature Cement"*
Distributors with Stocks and Service in Important Industrial Centers throughout the United States, Canada, and in 32 other countries.
In Canada, Quigley Company of Canada, Limited, Lachine, P. Q.

5 · HEAT TREATMENT

O. E. HARDER, SECTION EDITOR

Thermal Treatment for Cold Drawn Sheet Steel. A. GONCHAROV. *Kach. Stal,* Vol. 5, No. 1, 1937, pp. 23-27. In Russian. A study of some sheets indicated that best stamping qualities are produced when the grain size is around 2200 square microns. Annealing at 1650° F. is recommended as the best treatment for sheets intended for deep drawing. (5)

Heating Steel in Continuous Furnaces. M. GROSHEV. *Teoria i Pract. Met.,* No. 3, 1937, pp. 25-32. In Russian. Theoretical considerations connected with the maximum efficiency of continuous furnaces are presented, based largely on published data. (5)

Automatic Control of Electrical Bar Heating. C. H. S. TUPHOLME. *Can. Chem. Met.,* Vol. 21, July 1937, p. 260. Descriptive. A new automatic photoelectric device for controlling the temperature of resistance-heated bars is described. It consists of a light-sensitive cell, which measures the visible radiation emitted from the hot body, and a relay which controls the heater. Radiations from a selected area of the heated body are focused and received by a light-sensitive cell contained in a light-tight chamber. Full automatic temperature control within 30° C. at 800° is obtained with still narrower limits at higher temperatures. WHB (5)

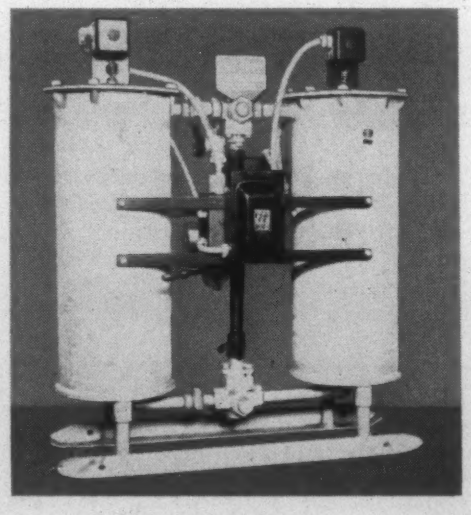
Gray Iron and Its Thermal Treatment. G. POGODIN-ALEKSEEV. *Liteinoe Delo,* Vol. 8, No. 4, 1937, pp. 28-32. In Russian. A brief but comprehensive description based on published data. (5)

5a. Annealing

Improving Chilled Car Wheels. S. C. MASSARI (Assoc. of Manufacturers of Chilled Car Wheels) *Steel,* Vol. 101, Aug. 23, 1937, pp. 42-43, 69. Heat treating cycle (details not given) has been developed which provides an increase of 30-40% in strength and a uniformity in strength heretofore unobtainable. Properly heat treated wheel has a refined chill and matrix consisting of spheroidized cementite. New unit type of pit has been developed for application of process. It is constructed of low heat capacity, low thermal conductivity refractories designed so that sensible heat within wheel at time of shake-out is conserved and subsequent temperature drop automatically regulated to a preestablished rate. MS (5a)

Isothermal Annealing Tool Steel. A. ALIMOV, N. LIPCHIN & N. SIVKOV. *Kach. Stal,* Vol. 5, No. 2, 1937, pp. 37-39. In Russian. A two- to three-fold saving in annealing time can be effected by replacing usual annealing with heating to 900° C. to complete austenitic transformation and then transferring steel to a furnace heated to a subcritical temperature for 1-1.5 hrs. and cooling in air. Steels containing 0.38% C, 11.68 Cr; 0.49% C, 0.70 Cr, 1.42 Ni, 0.42 Mo; 0.93% C, 1.10 Mn, 1.20 Cr, 1.70 W; 0.31% C, 2.58 Cr, 8.40 W, 0.33 V; 0.70% C, 3.90 Cr, 17.5 W were investigated. (5a)

Look at the Back Cover for the NEW AJAX-HULTGREN High Speed HARDENING FURNACE!



FOR DRYING CONTROLLED ATMOSPHERES

USE THE

LECTRODRYER

This LECTRODRYER is used for preventing the forming of "blue" during the bright annealing process. It can handle 500 cubic feet per hour of gas continuously, drying it from a dewpoint of 55° F. to a dewpoint of 0° F., removing 8½ pounds of water from controlled atmospheres per day. It is electrically operated and has a connected load of only 1½ KW. This load is connected only half of the time that the unit is in operation.

If dryness would improve your annealing atmosphere —investigate the LECTODRYER.

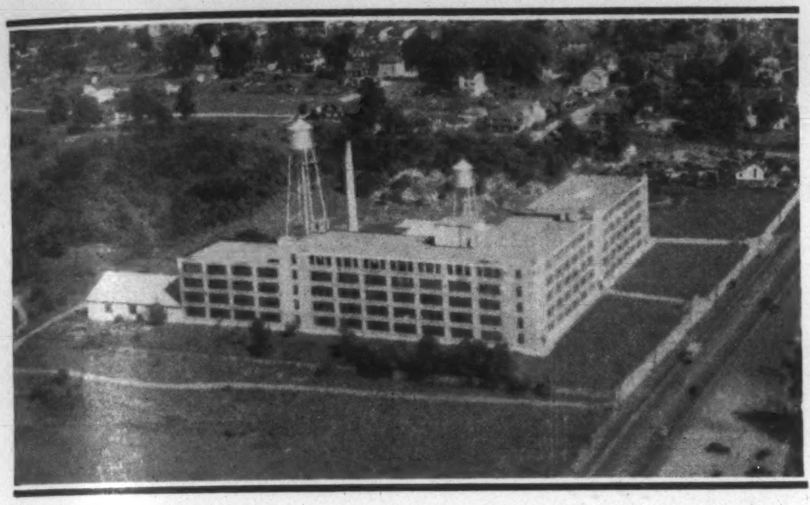
PITTSBURGH LECTRODRYER CORP.
32nd Street and Allegheny River Pittsburgh, Pa.

Supporting Every Claim

for AEROCASE

CASE HARDENING

COMPOUND



The Proving Ground for Uniform Economical Case Hardening

In this new laboratory of the American Cyanamid Company AEROCASE is tested under operating conditions.

Practically every heat treating problem in actual practice is reproduced in this laboratory, consequently. . . . .

When it is said that AEROCASE case hardening compound assures uniform production, with identical case depths for every standard heat, this has been predetermined both in the laboratory and field operations.

Likewise the economy of using AEROCASE has been proved in contrast to other compounds on the market.

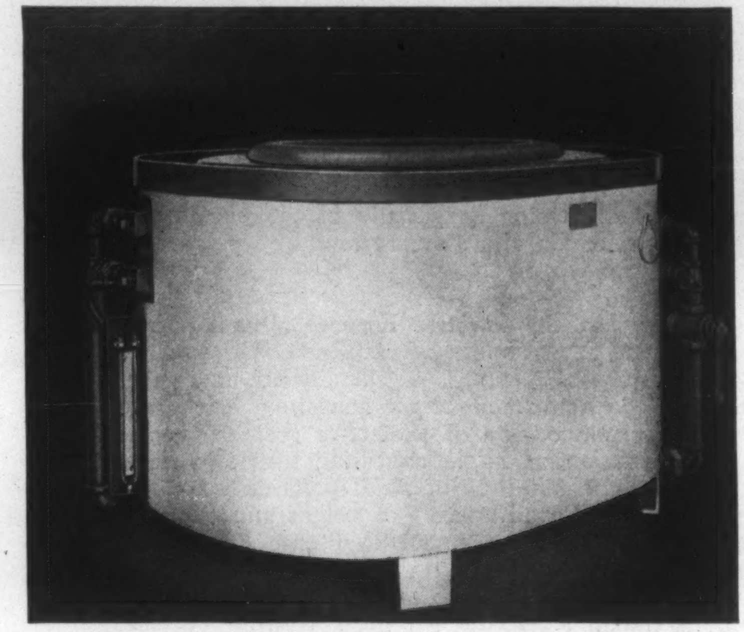
Therefore you can try AEROCASE with the assurance that it is reliably represented and backed by one of the world's largest manufacturing and research organizations.

Cyanamid metallurgists will gladly consult with you on your heat treating problems.

AMERICAN CYANAMID & CHEMICAL CORPORATION
30 Rockefeller Plaza • New York, N. Y.

JUTHE

Rectangular Gas Fired Pot Furnaces



Model GR-2

Pot. 24" long, 12" wide, 17" deep.
Four burners with down draft firing.

JUTHE Pot Furnaces are designed for lead hardening, cyaniding, liquid nitriding, drawing, and reheating operations.

Removable tunnel burners firing parallel to pot, adequate insulation, and patented pot seal provide uniform results and long life.

Single valve control
assures economical operation.

Write for detailed information

Gas Division

American Electric Furnace Company
29 Von Hillern St.,—Boston, Mass.
All Types Industrial Furnaces.

Evolution of Gas during the Annealing of Steel Sheets. HERBERT MONDEN & KURT SKROCH. *Sheet Metal Ind.*, Vol. 11, Mar. 1937, pp. 267-270. See *Metals and Alloys*, Vol. 8, Apr. 1937, p. MA 208R/3. AWM (5a)

Electric Furnaces with Controlled Atmospheres in the United States (Elektrische Glühöfen mit Schutzgas in den Vereinigten Staaten von Nordamerika) J. EBERWEIN. *Stahl u. Eisen*, Vol. 57, Aug. 26, 1937, pp. 937-945. American bright annealing installations and controlled atmosphere continuous normalizing furnaces are described. SE (5a)

Application of Controlled Atmosphere to the Annealing of Copper and Copper Alloys. W. A. DARRAH (Continental Ind. Engineers, Inc.) *Ind. Heating*, Vol. 4, July 1937, pp. 554-555, 560; Aug. 1937, pp. 619-622, 674-676; Sept. 1937, pp. 722-726; *Ind. Gas*, Vol. 16, Aug. 1937, pp. 8-11, 24. Survey. Properties of commercial electrolytic Cu, structural changes due to manufacturing and heat-treating processes, tendency to H embrittlement, furnaces used in heat-treating (especially bright-annealing), and fields of application for Cu alloys are reviewed. Ha (5a)

Bright Annealing in the Electric Furnace (Blankglühen im Elektroofen) ULRICH SCHWEDLER. *Tech. Zentralbl. tech. Metallbearbeit.*, Vol. 47, July 1937, pp. 535-539. Review under the following headings: development of bright annealing, bright annealing of steel sheets, composition of protective gas, gas generator, description and operation of bright annealing furnace, bright annealing in boxes, bright annealing of small parts on mass production scale. The following advantages of bright annealing in the electric furnace are particularly stressed: absence of complicated and expensive pickling, no chemical changes of surface of bright annealed material, absolute insurance against carburization or decarburization, maximum suitability for deep drawing purposes. EF (5a)

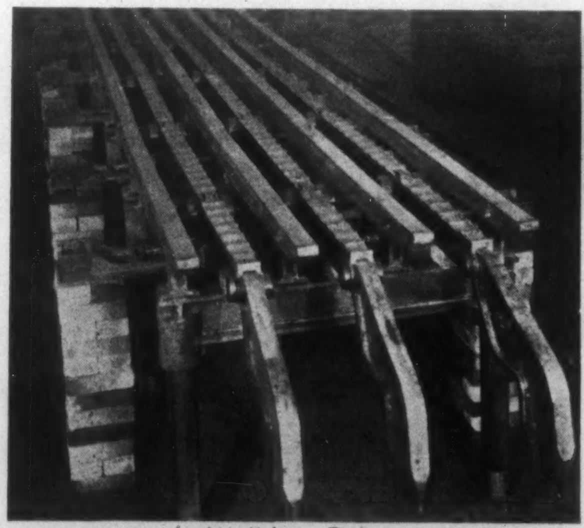
Bathtubs Annealed in Huge Atmosphere Furnace. E. STEPHENSON, JR. *Ind. Heating*, Vol. 4, Aug. 1937, pp. 636-638, 641. A continuous furnace for annealing for stress-relieving in a prepared atmosphere is described in full. Ha (5a)

5b. Hardening, Quenching & Drawing

Mechanical Properties of Large Steel Articles Subjected to Interrupted Quenching. E. TOVPENETS. *Kach. Stal*, Vol. 5, No. 2, 1937, pp. 33-36. In Russian. Original research. Tubes with wall thickness of 60-130 mm. and bars up to 155 mm. diam. made of steels containing: 0.33% C, 1.26 Cr, 0.30 Mo, 0.12 V; 0.37 C, 1.10 Cr, 0.36 Mo, 0.16 V; 0.38 C, 1.37 Cr, 0.34 Mo, 0.15 V; 0.38 C, 1.06 Cr, 0.38 Mo; 0.39 C, 1.15 Cr, 0.30 Ni, 0.39 C, 1.22 Cr, 2.75 Ni, 0.45 Mo and 0.37 C, 1.27 Cr, 3.18 Ni, 0.30 Mo, 0.30 V were subjected to interrupted quenching and the usual heat treatment. With the exception of 155 mm. diam. bar of 0.39 C, 1.15 Cr, 0.30 Ni steel, the usual heat treatment resulted in better physical properties. (5b)

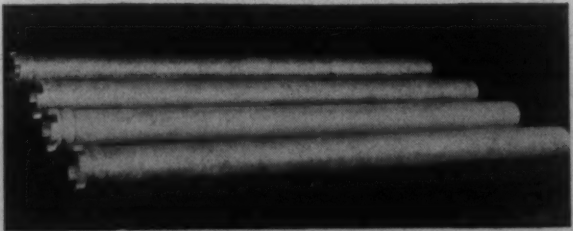
Influence of Heating Temperature and Grain Size on Austenitic Transformation and Hardness Penetration. S. STEINBERG, V. SKLUEV & S. NOSIREVA. *Kach. Stal*, Vol. 5, No. 1, 1937, pp. 21-23. In Russian. Original research. Specimens of eutectoid steel were heated to 800° and 1100° C. and subjected to isothermal decomposition. Curves plotted indicated that initial heating to the higher temperature increases 3-4 times the period required for starting transformation and the time consumed for total decomposition between 250° and 650° C. In order to find the influence of austenite grain size independently of the temperature of its formation a wedge-shaped specimen was heated to the desired temperature, deformed into a plate with a single blow of a hammer, immediately returned into the furnace at the same temperature for 10 min. and subjected to interrupted quenching. This produced specimens with medium size grain in slightly deformed section, fine grain in greatly deformed and exceptionally large in critically deformed. Grain size of austenite produced at the same temperature affects neither the critical period nor the time required for total transformation. (5b)

The Heat-treatment of Structural Steel. LOXLEY. *Metallurgia*, Vol. 16, May 1937, pp. 12-14. Review. Discusses dimensional changes, preparation for machining, preliminary treatments, and quenching and tempering of C and alloy steels. JLG (5b)



Walking Beam

Rotary Hearth



Centrifugally Cast Rollers

CALITE

CHROMIUM-NICKEL MOLY ALLOY CASTINGS

Combining
HIGHEST CREEP STRENGTH
(LOAD CARRYING UNDER HEAT)
PERMANENT DUCTILITY
(PREVENTS CRACKING)

The Choice of Leading Furnace Manufacturers for Alloy Furnace Parts

If *you* still believe all Chrome Nickel alloys of same Cr Ni content are about the same—let us give you the Facts, —backed by tests of CALITE B-28 in TWO leading Neutral Laboratories. CALITE B-28 has TWICE the load carrying ability of several well advertised alloys of similar but not identical composition and method of manufacture.

Superior Foundry Technique
Widest Selection Hi-Temp Metals
CENTRIFUGAL Casting
14 Years' EXPERIENCE

Send for Bulletin

THE CALORIZING COMPANY
415 Hill Ave. — PITTSBURGH, PA.

Graphitic Steel; Its Fabrication, Heat Treatment and Application to Dies and Punches. G. A. STUMPF & F. R. BONTE (Timken Roller Bearing Co.) *Heat Treating Forging,* Vol. 23, Aug. 1937, pp. 380-385; *Steel,* Vol. 101, Aug. 30, 1937, pp. 34-39. Devoted largely to heat treatment of graphitic steel dies and punches. For H_2O hardening applications, steel contains 1.50% total C and 1% Si. For oil hardening applications, or for keeping distortion to a minimum and for special toughness, 0.25% Mo is added. Generally, many of the H_2O hardening dies are quenched in H_2O or brine from 1150° F. and drawn at 300° F. Soaking time before quenching should be at least 1 hr. per in. of section and drawing time should be at least 4 hrs. per in. of section. Many of the pieces containing Mo are quenched from 1475° F. and drawn at 300° F. MS (5b)

Thermal Treatment of Silicon Steel Spring Strip. C. KOLCHIN & I. SAVINKOV. *Kach. Stal,* Vol. 5, No. 2, 1937, pp. 27-33. In Russian. Strip containing 0.68% C, 0.60 Mn, 1.72 Si, rolled to 0.6 mm. x 25 mm. was subjected to interrupted quenching as well as to the usual heat treatment suitable for springs. The results produced were compared on the basis of springiness and alternate bend tests. Physical properties produced by different treatments were practically the same. The endurance properties depend considerably on the quality of strip. Decreasing cold deformation before the final treatment increases endurance figures and affects the springiness only slightly. Annealing at 600°-700° C. before heat treatment greatly improves properties of the springs. (5b)

Influence of Tempering at Low Temperatures on Mechanical Properties of Quenched Steels. B. SHEININ. *Kach. Stal,* Vol. 5, No. 1, 1937, pp. 13-20. In Russian. Review. Breaks in the curves of impact strength vs. drawing temperature correspond to decomposition of residual austenite, separation of C from supersaturated α martensite and coagulation of carbides. In alloy steels the last two predominate. (5b)

Surface Hardening by the Acetylene-oxygen Flame. W. EBERLE. *Eng. Progress,* Vol. 18, Sept. 1937, pp. 205-208. Principles of the process are explained. Ha (5b)

5c. Aging

Age-hardening of Al-rich Al-Cu-Mg Alloys. H. NISHIMURA, *Nippon Kinzoku Gakukai-Si,* Vol. 1, June 1937, pp. 59-70. In Japanese. Original research on the cause of the age-hardening of duralumin and 24S super-duralumin. These alloys age-harden markedly at room temperature when they are quenched from temperatures near 500° C., but the Al alloys containing Cu or Mg_2Si do not show such marked age-hardening at room temperature. Age-hardening of duralumin and 24S super-duralumin is due to the decrease of the solid solubility of the disperse phase in Al with the fall of temperature, as with the alloys containing Cu or Mg_2Si. This, however, does not apply to the age-hardening of duralumin at room temperature, and to the necessity of tempering of the alloys containing Cu or Mg_2Si at 150-170° to attain the max. hardness. Chill cast alloys corresponding to 8 sections cut through the Al-axis were prepared, and after annealing at 500° C. for 16 hrs. they were quenched in water and aged at room temperature. The change of hardness during the aging was measured with a Brinell tester. The hardness test indicates that the alloys containing only Cu show no marked increase of hardness by the aging at room temperature, but the addition of Mg to Al-Cu alloys considerably affected the natural age-hardening, and the phenomenon of aging of the alloys containing more Cu than the ratio 4:1.5 in Cu and Mg is somewhat different from that in alloys containing less Cu than this ratio. The alloys containing less Cu than this ratio show less age-hardening at room temperature. By tempering at 50° and 100° C. immediately after quenching, the alloys containing more Cu than the ratio showed less hardening than at room temperature, but the alloys containing Cu and Mg between the ratios 4 : 1.5 to 1 : 1 were hardened remarkably by tempering at 100° C. From the previously published diagram of the Al-Cu-Mg system the age-hardening of Al-rich Al-Cu-Mg alloys is concluded to take place because of the precipitation of either a ternary compound $Al_{13}Mg_8Cu_7$ (denoted S), or $CuAl_2$ and this ternary compound from Al-solid solution. KT (5c)

Aging and Properties of Al-Mg Alloys. D. PETROV. *Metallurg,* Vol. 12, Mar. 1937, pp. 95-102. In Russian. A series of 19 alloys containing up to 12% Mg to some of which 0.6-1.0% Be, 2% Cu, 0.4-0.8% Cr, 1.0% Li were added either singly or together was investigated. Aging at room temperature does not affect properties of the alloys studied. Alloys with more than 8% Mg age rapidly at 150° C. Be and Cr accelerate aging, while Li and Cu have no effect. (5c)

TAG CELECTRAY

PHOTOCELL···ELECTRIC···LIGHT RAY

where split-second furnace control becomes an actuality

Above are shown CELECTRAY Indicating Potentiometer Controllers in service at a prominent New England brass company's plant, on 3 Hevi Duty Electric Heat Treating Furnaces. Built for rugged resistance to all plant conditions, these CELECTRAY Controllers provide a degree of sensitivity and split-second action that is unexcelled.

TAG offers the metal industry an equally capable, complete line of high speed, photoelectric action CELECTRAY PYROMETERS for indicating and recording, as well as controlling.

Ask for the facts, and learn how these faster, more sensitive Pyrometers of supremely simple design can be put in precise and economical service on your equipment. . . . Send for Catalog 1101-78.

PRESSURE LEVEL TEMPERATURE FLOW

C. J. TAGLIABUE MFG. CO.
Park & Nostrand Ave's., Brooklyn, N. Y.

Quiet Please
FLASH
a lusty addition to the w.k. Lindberg family - in January!

THE OLDEST and LARGEST
Exclusive Manufacturer of
HEAT AND CORROSION RESISTING CASTINGS
Solicits your business on a basis of
UNEQUALED EXPERIENCE

If you do not read our four-page house organ, *Alloy Progress,* running in the magazine, *Metal Progress,* send us your name for our mailing list.

GENERAL ALLOYS CO.
BOSTON, MASS.
Offices in 18 Principal Cities

New Precipitation-hardenable Alloys with Small Temperature Coefficient of Elastic Modulus (Ueber neue thermisch vergütbare Legierungen mit kleinem Temperaturkoeffizienten des Elastizitätsmoduls) R. Straumann. *Helv. Phys. Acta,* Vol. 10, July 15, 1937, pp. 269-270. Discusses the drawbacks of Elinvar alloys (25% Ni, 10% Cr, 1% C, bal. Fe) and claims superiority of the Nivarox alloys in which C has been replaced by Be in conjunction with additions of Mo, W, Ti, Si and Mn. The spontaneous magnetization can be varied by the alloy additions and the amount of cold working and by the mechanical state of stress due to controlled precipitation hardening treatments. EF (5c)

The Influence of Hydrostatic Pressure on the Hardening of Duralumin (Der Einfluss des hydrostatischen Druckes auf die Aushärtung von Duralumin) G. Tammann & H. Hartmann. *Z. Metallkunde,* Vol. 29, Mar. 1937, pp 88-89. Research. The aging of duralumin at room temperature with hydrostatic pressures of 15, 21,000 and 42,000 lbs./in.^{2} was studied by hardness measurements. The rate of hardening decreased with increasing pressure, and the effect of 42,000 lbs./in.^{2} was more than double that of 21,000. GD (5c)

The Theory of Age-hardening. M. L. V. Gayler. *Engineer,* Vol. 163, Mar. 19, 1937, p. 328. *Engineering,* Vol. 143, Mar. 19, 1937, pp. 322-323. Includes discussion. See *Metals and Alloys,* Vol. 8, July 1937, p. MA 433R/3. LFM (5c)

5d. Carburizing

Malleablizing. L. M. Lindsey (Surface Combustion Corp.) *Ind. Gas,* Vol. 16, Aug. 1937, pp. 12-13, 20. Describes some controlled atmosphere batch and continuous type furnaces. Ha (5d)

Application of Gas Radiant Tubes to Short-cycle Malleable Annealing Furnaces. C. H. Martin. *Ind. Heating,* Vol. 4, Aug. 1937, pp. 632-634. Absence of combustion products results in a better product. Time of the malleableizing cycle was shortened to 14 hrs. Ha (5d)

Malleable Iron Castings. E. Touceda. *Product Eng.,* Vol. 8, Oct. 1937, pp. 393-395. Practical. Present methods of malleableizing, points to be observed, and testing methods are discussed in general and a table of physical constants is added. Ha (5d)

5e. Carburizing

Equilibria in the Carburizing of Iron by Gases. Osamu Madono. *Bull. Inst. Phys. Chem. Research, Tokyo,* Vol. 16, May 1937, pp. 258-264. In Japanese. *Sci. Papers Inst. Phys. Chem. Research, Tokyo,* Vol. 31, May 1937, Abstracts supplement, pp. 24-25. In English. Original research. The carburizing of Fe by CO has heretofore been erroneously represented as follows:

$$3\ Fe + 2\ CO = Fe_3C + CO_2 \qquad (1)$$

Since solid cementite is unstable and is decomposed to graphite at any temperature:

$$Fe_3C \rightarrow 3\ Fe + C \qquad (2)$$

By adding the equilibrum (3)

$$2\ CO \rightleftarrows C + CO_2 \qquad (3)$$

to (2), there results:

$$Fe_3C + CO_2 \rightarrow 3\ Fe + 2\ CO \qquad (4)$$

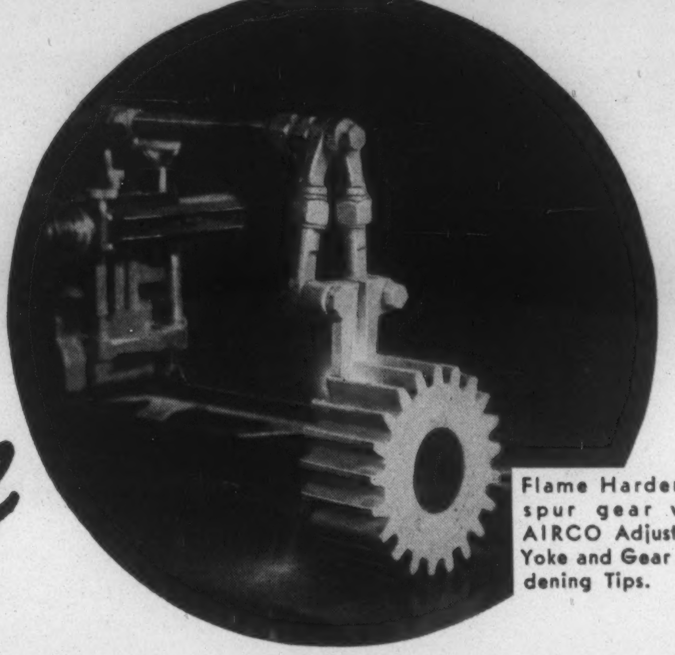
which reaction does not permit solid cementite to be deposited from the saturated solid solution of Fe. In the presence of excess CO, graphite is deposited by the dissociation of CO itself. Owing to the co-existence of graphite, the dissociation pressure of CO must be identical with the saturation pressure of CO co-existing with the saturated solid solution. Consequently, on carburizing Fe by gases, the C content of Fe cannot exceed the saturation concentration of the solid solution, which must be distinguished from cementite. The equation for the carburizing process should be:

$$\text{(solid solution)} + 2\ CO \rightleftarrows C\ \text{(solid solution)} + CO_2$$

This relation has been graphically presented in a temperature vs. % C diagram at 1 atm. pressure. EF (5e)

Speeding Carburization by Using Electric Current. N. Gudtsov & I. Sumin. *Metallurg,* Vol. 12, Apr. 1937, pp. 55-57. In Russian. Passing electric current through specimens and the carburizing compound causes arcing which speeds the reactions of dissociation of the carburizing compound and increases partial pressure of CO leading to faster carburization. The specimens so produced contain no free cementite in hypereutectoid zone. (5e)

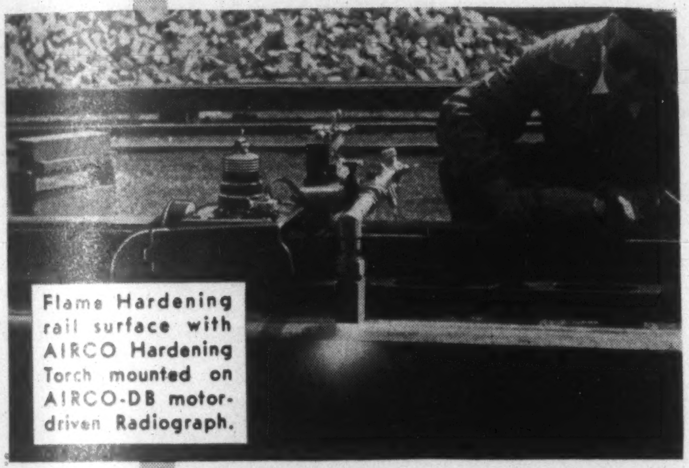
Read about this important advance in FLAME HARDENING

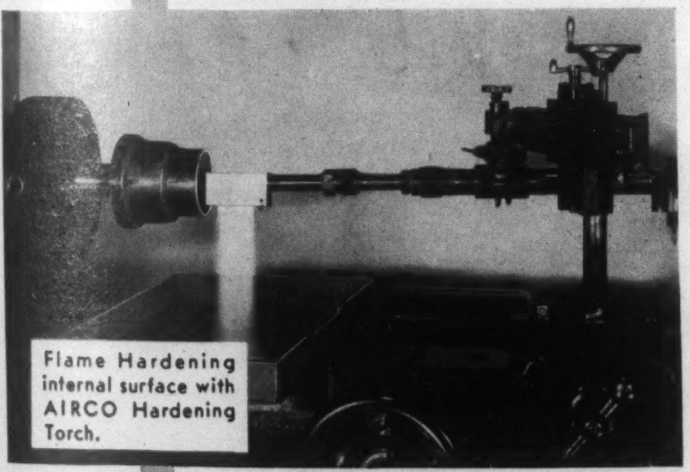

Flame Hardening spur gear with AIRCO Adjustable Yoke and Gear Hardening Tips.

AIRCO'S development of a variety of tips and torches combining the functions of heating and quenching, has made practical the flame hardening of *selected* areas of large machine parts, *with accurate control of degree of heat treatment and depth of penetration.*

With this equipment the desired degree of hardness can be obtained, and can be confined to the area where it is wanted, *without distortion of the part body and reduction of its shock-resistant properties.*

Everyone interested in the hardening of wearing areas of parts such as gears, cam shafts, journals, liners, wheels, rails etc., will want to know about these new developments. They are described in the FLAME HARDENING BULLETIN. The COUPON will bring you a copy. MAIL IT—TODAY.


Flame Hardening rail surface with AIRCO Hardening Torch mounted on AIRCO-DB motor-driven Radiograph.


Flame Hardening internal surface with AIRCO Hardening Torch.

AIR REDUCTION

SALES COMPANY

General Office: 60 East 42nd St., New York, N. Y.
OFFICES and DISTRIBUTING STATIONS in PRINCIPAL CITIES

Airco Process of Flame HARDENING

AIR REDUCTION SALES COMPANY

MA-12

AIR REDUCTION SALES CO.
60 East 42nd St., New York, N. Y.

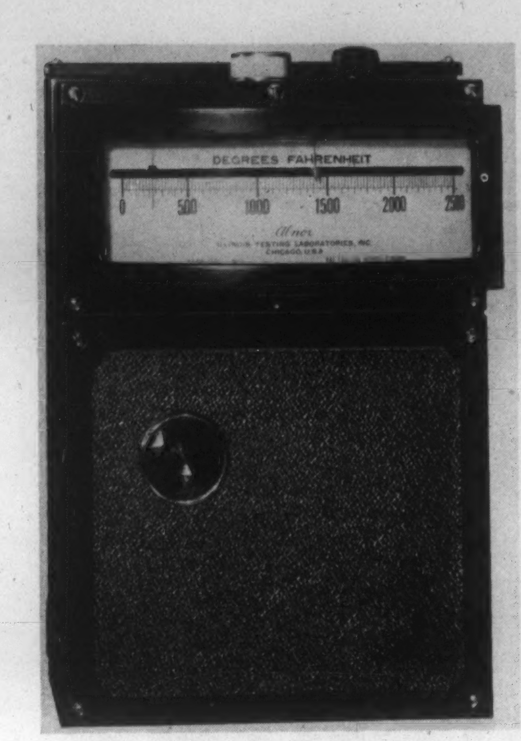
Send me a free copy of the new FLAME HARDENING BULLETIN.

NAME ....

COMPANY ....

ADDRESS ....

CITY ....STATE ....



The New

Alnor

Pyrometer
Controller

U. S. Patent No.
1,861,929

June 7, 1932. Others
Pending.

Here is a very moderately priced simplified Controller, which operates on the electronic principle similar to a radio.

It controls electric heat directly, or oil or gas fired units with motorized or solenoid valves. A red bull's eye indicates whether the heating unit is on or off.

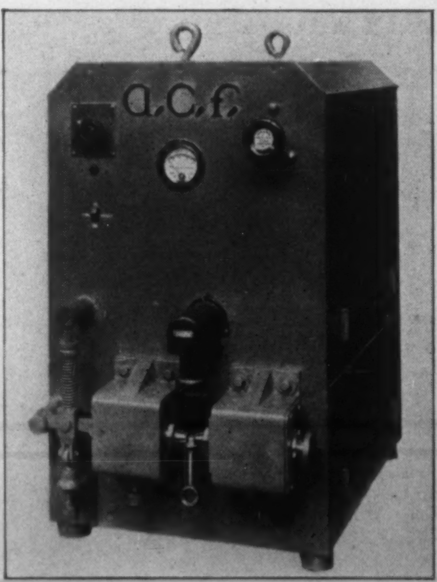
It has no motors, no depressor bars, no contacts to stick or become inoperative. The temperature indicating pointer is free at all times to give continuous indication and hair-line control.

Write for New Folder

ILLINOIS TESTING LABORATORIES, INC.
425 No. LaSalle St. Chicago, Ill.

a.c.f.

Berwick Electric No. 1, Type C
Horizontal
HEATER



For spot heats on rounds or flats, this No. 1 Type C Heater is designed for heating — normalizing and hardening. Equipped with electric eye for temperatures as low as 1100°F. and electric time clock to give a soaking heat from a split second up. Scale is reduced to a minimum.

Write or send samples to

AMERICAN CAR AND FOUNDRY COMPANY
30 CHURCH STREET . . NEW YORK, N. Y.
CHICAGO DETROIT ST. LOUIS

Modest or Pretentious—

WHETHER it be a single room (as above) or an elaborate suite, you will find Hollenden guest rooms modern and up-to-the-minute in decorations, equipment and furnishings. We are completing a modernizing program which make Hollenden guest rooms as fine as any to be found in Cleveland. The location is ideal, the service excellent, the food of the best and the prices moderate. Select the Hollenden on your next trip to Cleveland.

HOTEL HOLLENDEN
A DeWitt Operated Hotel CLEVELAND *R. F. Marsh, Mgr.*

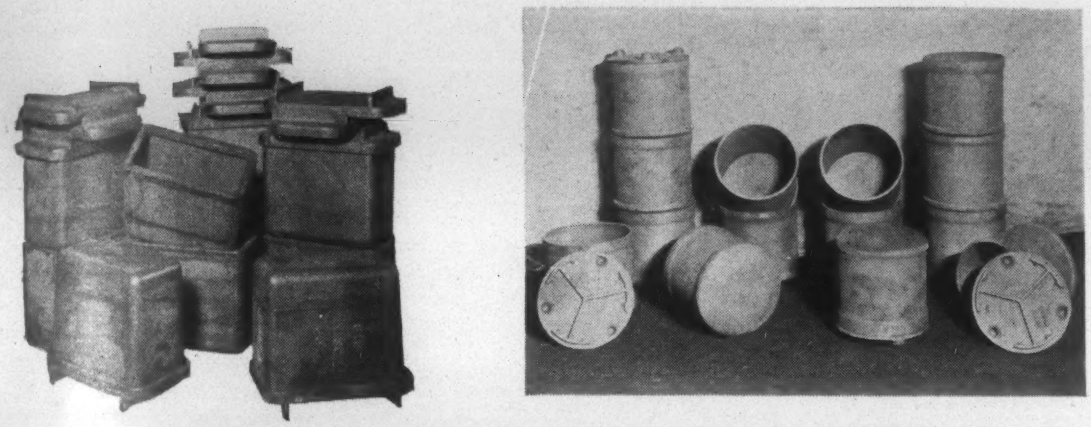
5f. Nitriding

Influence of Catalysts on Nitriding. I. AFONSKI. *Metallurg,* Vol. 12, Mar. 1937, pp. 8-14. In Russian. Experiments conducted with 0.32% C, 0.25 Si, 0.51 Mn, 0.011 S, 0.016 P, 1.48 Cr, 0.81 Al, 0.25 Mo steel showed that the use of dolomite or pure MgO as catalysts does not increase either the depth of case produced or the amount of N absorbed but only shortens by about 3 times the time required for building the case of the usual thickness and of a Vickers hardness higher than 1000. MgO polymerizes H leading to an increased concentration of active N. Both dolomite and MgO act identically and as typical catalysts. (5f)

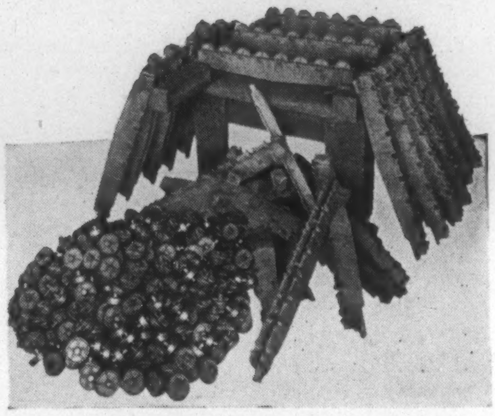
Some Experiments on the Influence of Silicon, Phosphorus, and Manganese on Nitrogen-hardening Cast Iron. J. E. HURST. *J. Iron Steel Inst., London,* Advance Copy No. 8, Apr. 1937, 10 pp; **Nitrogen-hardening Cast Iron, Influence of Silicon, Phosphorus and Manganese.** Ibid., *Iron & Steel Ind.,* Vol. 10, May 5, 1937, pp. 428-431. Original research. Influence of Si, P, and Mn on N hardening of cast Fe was investigated. Si appeared to have an influence on the total depth of penetration—the higher the Si the lower the total depth of the N-hardening effect. Variation in Si did not appear to affect surface hardness. In excess of 0.20%, P is accompanied by a reduction in surface hardness, but depth of hardening is not influenced. Mn did not affect either surface hardness or depth of hardening. Results seemed to show that Cr tends to insure greater depth of penetration rather than to affect surface hardness. N hardening at 3 temperatures—500, 550, and 600° C.—in the case of the Si series showed that penetration and growth increased with increased hardening temperature. The highest and most uniform values of hardness were obtained by nitriding at 550° C. JLG + CEJ (5f)

Operating Results of an Electric Case-hardening Furnace (Betriebsergebnisse eines elektrischen Einsatzhärteofens) H. REPKY. *Elektrowärme,* Vol. 7, July 7, pp. 150-152. Detailed figures are given; comparison with a gas-fired furnace for the same small automobile parts shows a slightly lower thermal efficiency for the electric furnace, but the latter offers automatic control, which was not possible with the gas furnace. Ha (5f)

MISCO ALLOYS
for high temperature service



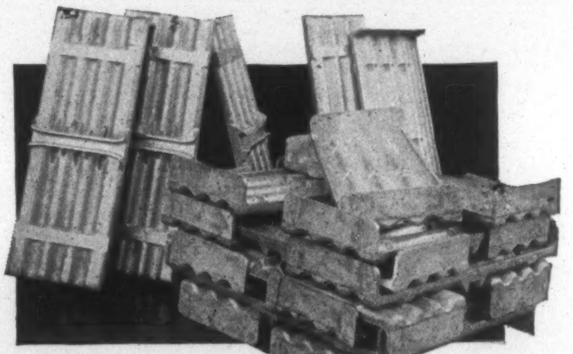
CARBURIZING BOXES—*Centrifugally or stationary cast*



ROLLER RAILS

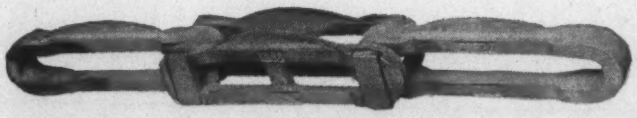
CYANIDE AND LEAD POTS

FURNACE CONVEYOR ROLLS
Centrifugally cast tubes with flash welded ends

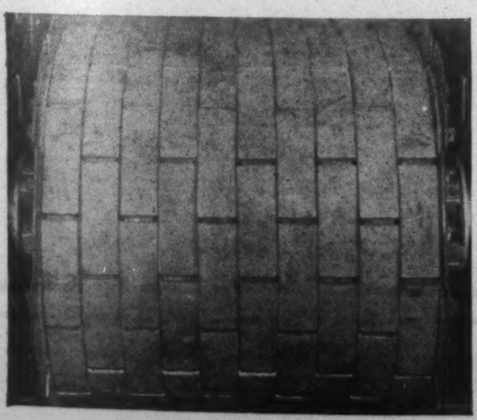


TRAYS—*Corrugated design originated by Misco*

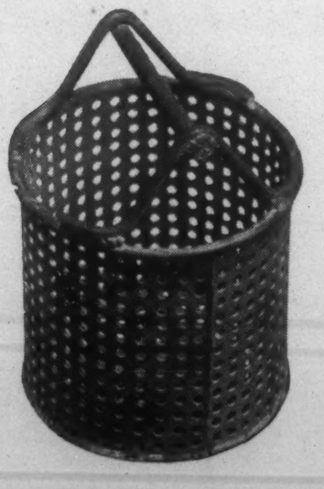
YOUR INQUIRIES ARE INVITED



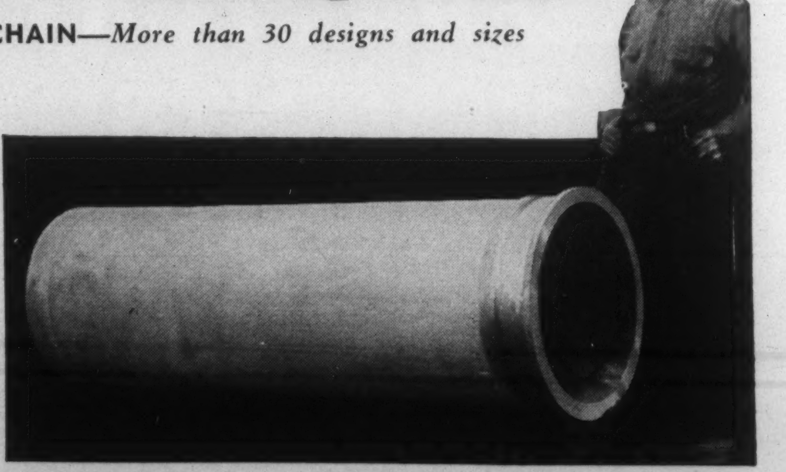
CHAIN—*More than 30 designs and sizes*



BELT CONVEYORS



CYANIDE DIPPING BASKETS
Any size, any type bail



RETORTS—*Centrifugally or stationary cast*

MICHIGAN STEEL CASTING COMPANY
One of the World's Pioneer Producers of Heat and Corrosion Resistant Alloy Castings
1981 GUOIN STREET, DETROIT, MICHIGAN

MISCO
Heat and Corrosion Resistant Alloys

6 · FURNACES, REFRACTORIES AND FUELS

M. H. MAWHINNEY, SECTION EDITOR

The Crystal Structure of "Beta Alumina" Na_2O . 11 Al_2O_3. C. A. Beeves (Univ. Manchester) & M. A. S. Ross (Univ. Edinburgh) *Z. Krist.*, Vol. 97, July 1937, pp. 59-66. In English. Original research. Alumina has been thought to possess a hexagonal form which has become known as "beta alumina." It has been shown, however, by chemical analysis and from X-ray measurement of the unit cell and the density that the true formula for "beta alumina" is Na_2O . 11 Al_2O_3, whose structure is described. EF (6)

New Special Atmosphere Furnace. W. F. Ross (Electric Furnace Co.) *Wire & Wire Prod.*, Vol. 12, Aug. 1937, pp. 411, 446-447. Descriptive. The furnace has a zone-controlled atmosphere for scale-free, bright-annealing of bronze, brass, phosphor-bronze and Ni-Ag. Capacity 1000 lb./hr. Ha (6)

Annealing Iron Castings by Gas. T. W. McKenna (Delaware Power & Light Co.). *Ind. Gas*, Vol. 16, July 1937, p. 13. Descriptive of a gas-fired kiln for annealing malleable Fe castings. Ha (6)

Electric Heat-treatment Furnaces for Ferrous Metals. G. B. Lamb. *Elec. Times*, Vol. 91, May 27, 1937, pp. 721-723. Descriptive. JCC (6)

Chequer Work Bricks in Open-hearth Furnaces. Alfred B. Searle. *Iron and Steel Ind.*, Vol. 10, July 1937, p. 522. See *Metals and Alloys*, Vol. 8, Aug. 1937, p. MA 486L/3. CEJ (6)

Selection of Bituminous Coals of Don Basin for Open-hearth Gas Generators. V. Karmazin. *Teoria i Pract. Met.*, No. 3, 1937, pp. 33-41. In Russian. A series of experiments was conducted to determine the suitability of local coals for gas generator use. A detailed account of properties and behavior of coals is given. (6)

Briggs Steel Bath Tubs Annealed in Huge Atmospheric Furnace. C. R. Wylie (Briggs Mfg. Co.) *Iron Age*, Vol. 140, July 1, 1937, pp. 34-37. Practical. Describes what is claimed to be the world's largest continuous counterflow annealing furnace of the controlled atmosphere type for annealing bath tubs. Propane gas is the fuel used. Tubs are made from ingot Fe of 0.015% C content and 0.078 in. gage. VSP (6)

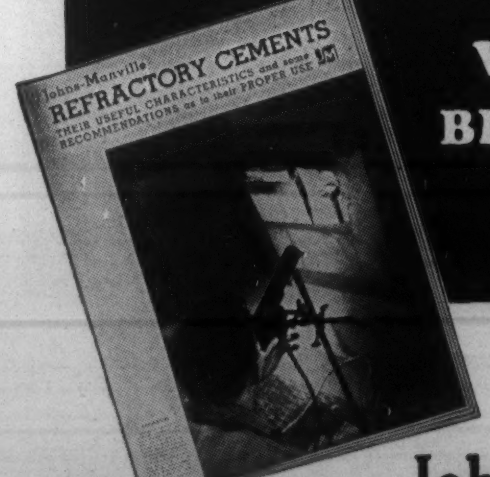
Application of Vertical Gas Fired Tubes to Galvanizing Furnaces. A. M. Thurston (East Ohio Gas Co.) *Iron Age*, Vol. 140, July 29, 1937, pp. 38-39; **Heating of Galvanizing Furnaces by Gas Radiant Tubes.** A. M. Thurston. *Ind. Heating*, Vol. 4, July 1937, pp. 550-552, 566; *Ind. Gas*, Vol. 16, July 1937, pp. 17-18, 21. Describes installation of vertical tubes in galvanizing furnace of National Telephone and Supply Co., Cleveland. Tubes are fired from top down. Core busters are used in upper section of tubes to delay flow of heat and to concentrate it at proper level. Tubes are 11 gage seamless, 25-12 alloy steel welded at top to cast elbows. Blast type burners are used with natural gas at 6 oz. and air at 1 lb. pressure. VSP + Ha (6)

Minimize refractory maintenance with

Johns-Manville
REFRACTORY CEMENTS

Write for
BROCHURE
RC-6A

Johns-Manville
22 East 40th Street, New York City


Johns-Manville
REFRACTORY CEMENTS
THEIR USEFUL CHARACTERISTICS and some RECOMMENDATIONS as to their PROPER USE

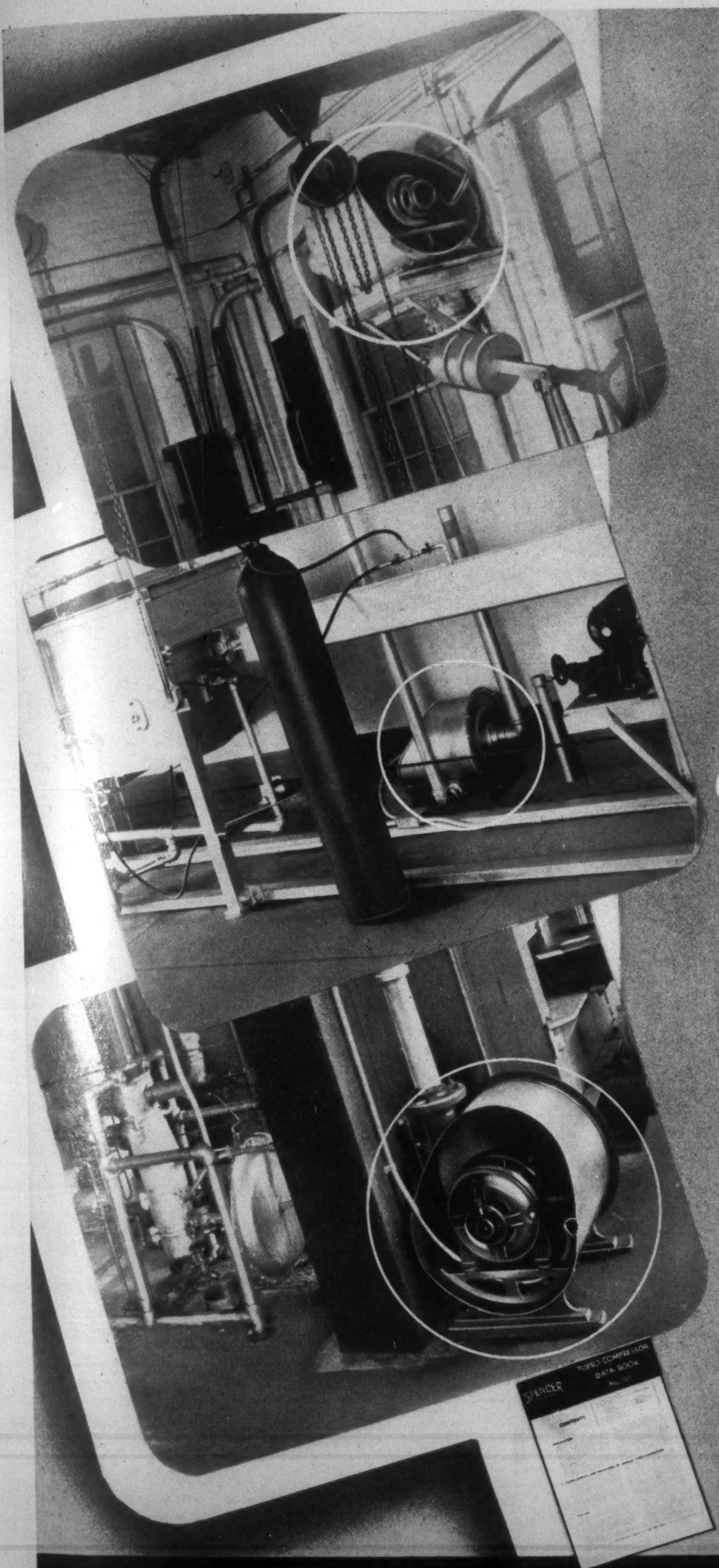
LONG
VITREOSIL
TUBES
for
METALLURGICAL USE

We are in a position to quote attractive prices on Vitreosil (vitreous silica) tubes 10 feet in length or even longer, in one piece. Like all Vitreosil products, these are immune to attack by acidic materials and intense heating or sudden changes of temperature.

On account of its chemical purity and complete freedom from carbon, iron, etc., Vitreosil offers unique advantages in metallurgical fields. Such tubes are especially suitable for reduction processes, construction of continuous rotary furnaces, etc.

We shall be glad to receive your inquiries for tubes in special lengths.

The Thermal Syndicate Ltd.
12 East 46th Street
New York, N. Y.



Economy

When business is good—shut-downs are expensive. When business slows up—maintenance and repair costs are watched carefully.

Spencer Turbo-Compressors, through the years, have faithfully met the demands—both ways. Scores of plants use them—continuously—24 hours a day. The maintenance cost is so low that it is seldom mentioned.

And there's another economy — illustrated by the three views at the left. Because of their small size, light weight and freedom from vibration, you can locate Spencer Turbos exactly where you want them, at little cost for installation.

Your furnace, burner or oven manufacturer can select the correct Spencer Turbo for your service. Ask him.

- SPENCER HARTFORD
- TURBO COMPRESSORS
- LOW SPEED
- HIGH SPEED
- SINGLE STAGE
- MULTI-STAGE
- CORROSION RESISTANT
- GAS TIGHT
- 1/3 TO 300 H. P.
- 8 OZ. TO 5 LBS.
- 35 TO 20,000 CU. FT.

This Spencer Turbo Data Book will be sent on request.

121-B

SPENCER
HARTFORD

TURBO-COMPRESSORS

THE SPENCER TURBINE COMPANY • HARTFORD, CONN.

Plastics Available for the Metal Industry

P.B. SILLIMANITE AIR-SETTING CEMENT
A strong bonding, practically non-shrinking, refractory cement having smooth working properties. P.C.E.—Cone 34 (3200°F.).

P.B. SILLIMANITE RAMMING MIX
A scientifically compounded plastic super-refractory containing 6% moisture—NOT to be confused with ordinary plastic fire brick materials. Selection of bond clays and careful graduation of grain sizes provide excellent mechanical strength upon firing and insure against shrinkage and vitrification—even after continued use at elevated temperatures. P.C.E.—Cone 37 (3308°F.).

P.B. SILLIMANITE WET PATCH
A well-balanced, pre-mixed patching material having negligible shrinkage and high softening point. Used for maintaining linings of fuel-fired and electric melting furnaces. Also used for forming small burner tunnels and for ladle linings.

P.B. SILLIMANITE HYDROCAST
A dry refractory having a hydraulic bond. Mixed with water and can be cast in position like ordinary concrete. Can be used satisfactorily at temperatures up to 3000°F.

If the results you are getting are not entirely satisfactory, why not try Taylor-Made products and be satisfied?

THE CHAS. TAYLOR SONS CO.
CINCINNATI, OHIO

Gas Immersion Heating. J. B. NEALEY (Am. Gas Assoc.) *Iron Age*, Vol. 140, July 12, 1937, pp. 54-56. Discusses the advantages of gas immersion heating for hot solution tanks, cleaning tanks, etc. Immersion coils made of standard pipe are laid horizontally and close to bottom of tank with one end welded to hole in side of tank. Gas burner is clamped to outside of tank so as to fire through hole and into coil. Fe and steel pipes are used for ordinary cleaning solutions and Pb coils in acid tanks. VSP (6)

Modern Vertical Core Ovens. C. A. MAUCH (Gen. Motors Corp.) *Iron Age*, Vol. 140, July 1, 1937, pp. 26-28. Describes a new design of core oven of the vertical type. It occupies a space of 12 ft. by 15 ft. and extends 62 ft. above and 11 ft. below floor level. Correct baking and cooling cycle was found to be a 3 hr. bake at 400° F. and 1 hr. cool. Firing is done with 2 high-pressure inspirating type gas burners, using 1100 B.t.u. natural gas. Cites numerous advantages. VSP (6)

Slag Removal from Slag Pockets of Open-hearth Furnaces in a Single Block. M. BEILINOV. *Teoria i Pract. Met.*, No. 3, 1937, pp. 21-24. In Russian. Placing a one-half brick lining (made of silica brick) in slag pocket, and filling the gap between it and slag pocket walls with sand, permitted a comparatively easy removal of slag accumulation in a single block. (6)

The Warming-up of Open-hearth Furnaces, Preventing Refractories from Spalling. A. E. DODD. *Iron & Steel Ind.*, Vol. 10, May 1937, pp. 372-374. Practical. Spalling of SiO_2 bricks occurs at temperatures well below red heat so that in warming up a furnace either with coal fires or gas flares, proper control will reduce danger of spalling. A pyrometer control is essential. CEJ (6)

New Type of Blast Furnace Bottom. I. ASTAKHOV, I. NEKRASSOV, G. GRECHKO. *Teoria i Pract. Met.*, No. 3, 1937, pp. 17-20. In Russian. Bottoms are to be made of cast Fe blocks on the top of which a chromite lining is placed. (6)

Non-ferrous Melting Requires Excellent Furnace Operation. N. K. B. PATCH. *Foundry*, Vol. 65, July 1937, pp. 25-26, 66. Practical discussion of the care of various types of furnaces with special reference to furnace lining, air supply, etc. VSP (6)

The Cupola Furnace. H. E. ARBLASTER. *Commonwealth Engr.*, Vol. 24, May 1, 1937, pp. 333-334; Criticism of the use of auxiliary tuyeres as adopted in certain types of cupola for melting Fe. Most satisfactory results have been obtained with auxiliary tuyeres by closing them off altogether. EF (6)

Recent Instrument Developments. A. F. BROWNLEE. *Heat Treating Forging*, Vol. 23, Sept. 1937, pp. 469-472. Describes developments during past year in instruments and devices for temperature measurement and control of furnaces. See also *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 84R/3. MS (6)

Electric Muffle Furnaces for Hardening Steel. K. H. TWELE. *Eng. Progress*, Vol. 18, Sept. 1937, pp. 203-205. Advantages are described. Ha (6)

Some Electric Furnaces for Aluminium Alloys. G. B. LAMB. *Metallurgia*, Vol. 16, June 1937, pp. 39-41. Describes furnaces used in England for heat treatment of Al alloys. JLG (6)

Critical Remarks Regarding Hydraulic Theory of Furnaces. V. KUROEDOV. *Teoria i Pract. Met.*, No. 4, 1937, pp. 20-40. In Russian. Hydraulic theory of furnaces was compared in detail with energetic theory. The latter is more reasonable. (6)

Methods and Errors in Gas Temperature Measurements (Verfahren und Fehler bei Gastemperaturmessungen) RUDOLF HASE. *Z. Ver. deut. Ing.*, Vol. 81, May 15, 1937, pp. 571-575. Direct and indirect measuring methods of temperature are reviewed, and some indirect methods described. 45 references. Ha (6)

Combustion Processes in Open-hearth Furnaces Equipped with Venturi Ports. M. GROSHEV. *Teoria i Pract. Met.*, No. 4, 1937, pp. 51-60. In Russian. Combustion of gases in open hearth furnaces was extensively studied. 33 references, mostly Russian. (6)

Advantages of Air Circulation in the Electric Furnace for the Aluminum Industry (Vorteile der Luftumwälzung im Elektroofen für die Aluminium-industrie) J. EBERWEIN. *Aluminium*, Vol. 19, July 1937, pp. 452-455. Descriptive. Air circulation is of special advantage, even at higher temperatures, in heating materials with low radiation constant, e.g. Al, as the heating time is considerably reduced by the convection. An installation, with tests, is described in detail. Ha (6)

7 · JOINING

Soldering and Welding Light Metals. Kurt Nischk. *Metal Ind., London,* Vol. 50, Feb. 5, 1937, p. 265. Patent review. RWB (7)

7a. Soldering & Brazing

C. H. CHATFIELD, SECTION EDITOR

Fluxes for Use in Soft-soldering. J. W. Willstrop, A. J. Sidery & H. Sutton (Royal Air-craft Establishment) *J. Inst. Metals,* Vol. 59, No. 2, 1936, pp. 53-58. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 152 R/8. (7a)

Soldering Pipe Threads to Prevent Oil Leaks. Wm. J. Hart (Westinghouse Electric & Mfg. Co.) *Power Plant Eng.,* Vol. 41, July 1937, p. 425. Practical. ECK (7a)

7b. Welding & Cutting

E. V. DAVID, SECTION EDITOR

Controlling Distortion in Cutting and Welding Job. J. H. Cooper (Taylor-Winfield Co.) *Welding Engr.,* Vol. 22, July 1937, pp. 22-23; *Ind. & Welding,* Vol. 10, July 1937, pp. 21-22. Practical. In constructing chain testing machine the cutting of 20 ft. x 1 ft. bars from 3" thick plate was accomplished with two cutting torches making the cut 1 ft. apart, simultaneously. The cut was stopped 3 in. from both ends of the 20 ft. length, and finished after material was cold. A perfectly straight section is stated to have been produced by this method. WB (7b)

Welding in the Construction of Building Piping Services. A. S. McCawley (Thos. J. Douglass & Co.) *Welding J., N. Y.,* Vol. 16, July 1937, pp. 28-30. A survey of future market is made showing 54 feet of welding per ton of pipe, and total pipe consumption of 1,012,500 tons. Based on a cost of 11 cents per in. for preparing and welding joints, the annual business is figured as 72 million dollars. Use of machine flame cutting for piping simplifies job of cutting pipe into miter piece elbows, and tees; and tees with reduced branches. With the heating system where high vacuum is carried on steam and return, assurance is given by welding that air is not drawn into piping system. WB (7b)

Welded Constructions of Vehicles of the German State Railway (Geschweisste Fahrzeugkonstruktionen der Deutschen Reichsbahn) G. Maurerer. *Elektroschweissung,* Vol. 8, Sept. 1937, pp. 161-166. See *Metals and Alloys,* Vol. 8, Jan. 1937, p. MA 26L/1. HR (7b)

The Golden Gate Bridge is Completed. E. L. Mathy. *Welding J., N. Y.,* Vol. 16, July 1937, pp. 4-7. See *Metals and Alloys,* Vol. 8, Oct. 1937, p. MA 620R/4. WB (7b)

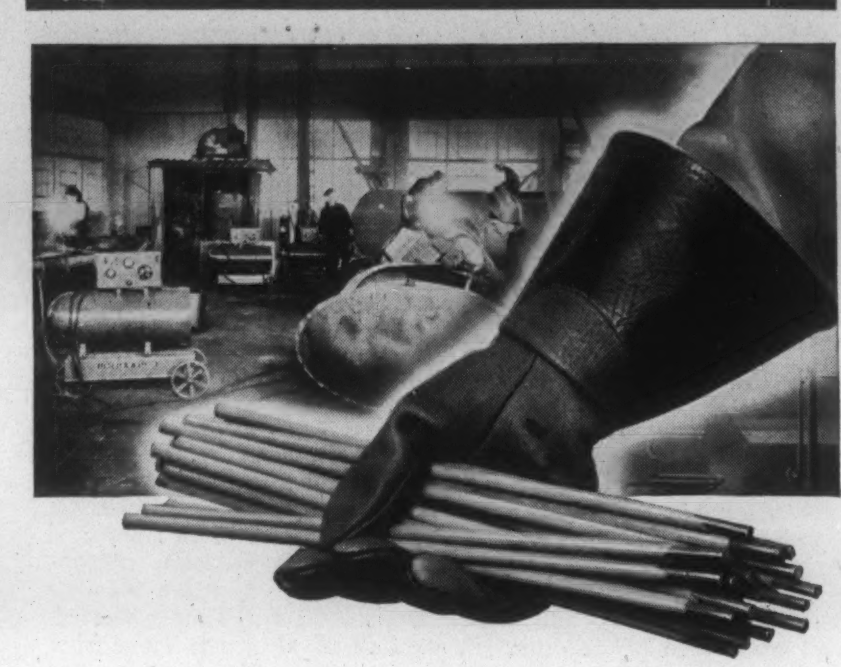
Precautions in Welding of Rustproof and Acid-resisting steels (Was ist beim Schweissen von nichtrostenden und Säurebeständigen Stählen zu Beachten) H. Hougardy. *Autogene Metallbearbeitung,* Vol. 30, July 1, 1937, pp. 223-227. Practical. Ferritic-martensitic and austenitic Cr-, Cr-Mo, Cr-Ni and Cr-Mn steels can be successfully welded by avoiding carbide formation due to overheating. Carbide formation and intergranular corrosion therefrom can be prevented by additions of Ta or Cb. Neutral flame must be maintained in oxy-acetylene welding. The use of a.c. or d.c., hammering after welding and welding of iron to steel are discussed with practical hints for procedure. Ha (7b)

The Atomic Arc Process and Its Application in the Welding of Aluminum and Aluminum Alloys (Das Arcatom- Verfahren und seine Anwendung zum Schweissen von Aluminium und Aluminium-Legierungen) E. Thiemer. *Metallwirtschaft,* Vol. 16, Aug. 13, 1937, pp. 814-816. Practical. Describes the atomic arc welding process and its application to light alloys. GA (7b)

Shrinkage Distortion in Welding—A Review of the Literature to January 1, 1937. W. Spraragen & G. E. Claussen (Welding Research Committee) *Welding J., N. Y.,* Vol. 16, July 1937, Supplement pp. 29-39. Another complete survey by the authors of a subject of vital importance to designers and fabricators of welded structures. Fundamental aspects are stated and discussed. The results of investigations are cited and assembled in tables and curves to give a record of the magnitude of shrinkage, perpendicular and parallel to the weld and angular distortion for butt welds. Fillet welds, tube welds, single bead welds are reviewed, and magnitude of distortion in welding of structures cited from the literature. Theoretical aspects in setting up formulae for calculations are reviewed. References to practical methods suggested in the literature for avoiding distortion are given. 83 references. WB (7b)

Light-load Steel Framing for Residences. George E. Routh (Bethlehem Steel Co.) *Welding J., N. Y.,* Vol. 16, July 1937, pp. 13-15. Descriptive. The cutting torch takes the place of the saw, and the metallic arc takes the place of the hammer and nails in new building construction. Built-up steel members of open-work type (min. thickness 1/8" material) are cut to length with torch. Weight of members is 50-100 lbs., heavier than wood joist or stud but greater strength permits spacing on 24 or 30 in. centers instead of 16 in. as with wood. Other advantages are lower sound penetration of walls or floor, lower thermal penetration, ease of installation of electrical ducts, etc., these advantages being due to the open, discontinuous metal frame. The houses illustrated are each of different type, showing same individuality obtainable as in wood house, and at practically same cost. Protection against fire, termites, warping, etc., is obtained at same time. WB (7b)

Another
Masterpiece
by the builders
of CYCLONE
SEE
JANUARY
ISSUE!



You can use larger electrodes and WELD 15% to 20% FASTER with the "Shield-Arc SAE"

SELF-PROTECTED AGAINST BURNOUT, the Lincoln "*Shield-Arc* SAE" Welder can be operated at high average loads continuously without harm or danger. This means that you can use larger electrodes than with conventional welders, resulting in faster welding. Users report production increases of 15% to 20% because of this built-in protection of the "*Shield-Arc* SAE." Ask for proof.

Write for a free copy of "The New Arc Welding Technique," which gives complete details about "SHIELD-ARC SAE"—THE COMPLETE WELDER.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND, OHIO
Largest Manufacturers of Arc Welding Equipment in the World

THE LINCOLN ELECTRIC COMPANY
Dept. LL-449, Cleveland, Ohio

☐ Send FREE copy of "The New Arc Welding Technique" for faster and better welding and hard-facing. ☐ Send the FREE Procedure Guide for Welding and Hard-Facing, (Bul. 401).

Name..Position..
Company..
Address..
City..State..

An Investigation of Plug and Slot Welds. GLENN JAMES GIBSON. *Welding J., N. Y.*, Vol. 16, July 1937, Supplement pp. 10-21. A thorough, detailed report on comprehensive tests of plug and slot welds for tension and compression shear. Various types of both welds were made for which the variables were amount of weld metal in plug weld, depth of plug, size of hole, type of welding electrode, position of welding, effect of welding current. The data are discussed and optimum conditions for weldability, strength and economy indicated. The data are presented in numerous tables and curves, and the various types of welds and failures obtained in destructive tests shown in photos. The conclusions are of importance in establishing the reliability of this type of joint and are given below as a matter of record for reference. "1. Complete face fusion is possible; therefore the strength of plug welds should be based on the shear of the gross area of the hole. 2. The filled type of plug weld has many advantages over the fillet types; they are quicker and easier to make, their strength is more uniform, they do not require as large a hole, and they have a much better finished appearance. 3. There is no danger of the filled plug cracking due to the shrinkage of the weld metal when made with modern heavy coated electrodes. 4. Large plug and slot welds fracture at reduced shear values because of a tendency toward progressive failure. 5. There is a minimum size of hole for each thickness of plate that can be successfully welded. 6. There is a maximum size of hole for each thickness of plate capable of developing the full shear strength of the plug weld. 7. The face shear failure of plug welds occurs in the 'burnt steel' surface of the fusion zone which results in the low shear strength of plug welds. 8. The shear strength of the weld metal from various brands and types of electrodes tested varied between 47,400 and 53,800 psi. 9. Plug welds can be successfully welded in a vertical position. 10. The highest practical welding current for the electrodes used shoud be employed for plug welds in order to develop the shear strength of the weld metal and to insure complete fusion. 11. Plug welds are remarkably tough and will not fail suddenly. 12. The distortion of plates due to plug welds is much less than that due to fillet welds. 13. The recommended sizes and design loads for plug welds are recorded in Table K. 14. When plug welds are used together with fillets, the combined strength of both will only be obtained when a certain minimum spacing of the plug welds is used." WB (7b)

The Welding of Unalloyed Steels with Different Carbon Contents (Das Schweissen von Unlegierten Stählen mit verschieden hohem Kohlenstoffgehalt) H. AYSSLINGER (Gutehoffnungshütte, Germany) *Mitt. Forsch-Anstalt. Gutehoffnungshütte Oberhausen A.G.*, Vol. 5, June 1937, pp. 112-124. Welding experiments were made with different bare and coated electrodes on unalloyed steels with 0.3-0.56% C, with regard to mechanical properties. If the electrode is properly selected steels with up to 0.6% C can be welded, so that the tensile strength and notch toughness in the weld are the same as in the un-welded material. With higher-C steel, however, the bending angle was much smaller in the seam than that of the non-welded material. C steels with more than 0.3% C should be welded with a thinly-coated electrode if fillet welding is to be applied; thickly coated electrodes may produce cracking in the weld. The individual results for tensile, bending and notch impact tests are given with micrographs of the structure. Ha (7b)

Some Effects of Welding on Ship Construction. JAMES B. HUNTER (Bethlehem Shibuilding Corp.) *Welding J., N. Y.*, Vol. 16, July 1937, pp. 23-25. Weight saving is effected by use of welding instead of riveting because of elimination of faying flanges and laps, and an approach to 100% strength of plate rather than 85% as in riveting. For stiffeners, welding has created a demand for special rolled sections which, if furnished by the steel mill would decrease amount and cost of welding. Increased rigidity of welded hull requires recognition of residual stresses as a weakening factor especially in primary strength members. It is impossible to eliminate these stresses by thermal treatment, due to size of the structure. Future large ship construction visualized as production of entire sections ideally positioned for welding in the yards, the sections then being joined on the ship. Intricate forgings and castings are being replaced by simple sections built up by welding. Procedure in erection and assembly, outfitting and completion of the vessel in shipyard has been revised due to welding. WB (7b)

A New Device for Hand Welding with the Arc (Ein neuartiges Gerät für die Handschweissung mit dem Kohlelichtbogen) E. THIEMER. *Elektroschweissung*, Vol. 8, July 1937, pp. 131-132. Descriptive. HR (7b)

Non-ferrous Welding (Some Problems) H. W. G. HIGNETT. *Metal Ind., London*, Vol. 50, Jan. 22, 1937, pp. 129-136; Feb. 26, 1937, pp. 275-278. 16 references. See *Metals and Alloys*, Vol. 8, Aug. 1937, p. MA 492L/3. RWB (7b)

Whitey Sez:

"It takes years and years to grow an oak, but for a squash—six months is sufficient ... We're not raising acorns, but the fruits of our ten years' labor could hardly be squeezed thru a colander, either!"

MAURATH, INC., CLEVELAND

BUILDER OF BETTER WELDING ELECTRODES IN ALL ANALYSES

Shipyard Installation. Ira B. Yates (Wilson Welder & Metals Co.) *Welding J., N. Y.*, Vol. 16, July 1937, p. 7. WB (7b)

Welding of Stainless Steel Strip (Schweissung von Dünnblechen aus rostfreiem Stahl) Trunschitz. *Autogenschweisser*, Vol. 10, June 1937, pp. 58-59. General remarks. EF (7b)

Welding Aluminum and its Alloys. *Welding J., N. Y.*, Vol. 16, July 1937. Supplement pp. 39-40. An extended abstract, by G. E. Claussen, of recent German literature. WB (7b)

New Jig Eliminates Welding Troubles. *Steel*, Vol. 101, July 12, 1937, p. 52. Descriptive. Welding jig was redesigned so as to prevent warping of welded cans fabricated from 18-gage sheet-steel. MS (7b)

Racing Yacht Uses Arc Welded Steel Construction. *Steel*, Vol. 101, July 26, 1937, p. 44. "Ranger," America's cup defender, is of all-steel fabrication. Arc welding was used extensively. Mast is of duralumin. Its fittings were also arc welded. MS (7b)

The Corrosion of Various Constructional Steels. J. Brillie, A. Leroy & A. Roux. *Welder*, Vol. 8, Oct. 1936, pp. 1114-1116; Nov. 1936, pp. 1141-1148; Dec. 1936, pp. 1176-1181; Vol. 9, Apr. 1937, pp. 122-125. **(Etude de la Corrosion de divers Aciers de Construction).** Idem. *Rev. Soudure Autogène*, Vol. 26, Sept. 1936, pp. 4-16. Original research of wide scope in covering variations in parent metal, weld metal, welding method and many types of corrosion tests. See *Metals and Alloys*, Vol. 7, Nov. 1936, p. MA 550R/7. WB + FR (7b)

Mechanical Testing of Welds (Mechanische Schweissnahtprüfung). H. Blumberg (I. G. Farbenindustrie). *Autogene Metallbearbeit*, Vol. 30, July 1, 1937, pp. 227-235. Descriptive and practical. Testing methods and preparation of samples are described, and correct and incorrect welds shown in diagrams. Ha (7b)

Fusion Welded Power Piping, Standards for Quality of Welding and Methods of Inspection. Wm. D. Halsey. *Locomotive*, Vol. 41, Jan. 1937, pp. 133-145. See *Metals and Alloys*, Vol. 8, July 1937, p. MA 425L/6. Ha (7b)

Opening of New Fields of Application for Gas-fusion Welding in the Construction of Pipe Lines (Erschliessung neuer Anwendungsgebiete für die Gasschmelzschweissung im Rohrleitungsbau) E. Stursberg. *Autogene Metallbearbeit.*, Vol. 30, July 1, 1937, pp. 203-210. Comprehensive review of development and present methods in welding pipe lines and domestic plumbing installations of Fe, steel, and Cu. Ha (7b)

Vacuum Tubes in Action. VII Welding. H. C. Stanley (Gen. Elec. Co.). *Electrical West*, Vol. 79, July 1937, p. 45. Discusses use of electronic tubes for control of welding current. MS (7b)

Internal Stresses in Welded Structures and the Possibilities of Relieving Them. Ragnar Liljeblad. *Mech. World Eng. Record*, Vol. 101, Apr. 23, 1937, pp. 421-422, Apr. 30, 1937, pp. 437-438, 452. Practical. Covers nature of welding stresses, diagrams of stresses, critical points, distortion, examples, practical tests, special cases. EF (7b)

Acetylene Welding for Repairing Automotive Vehicles (Azetylenschweissung als Ausbesserungsmittel für Kraftfahrzeuge). O. Lehmann & P. Bräuer. *Autogene Metallbearbeit*, Vol. 30, July 1, 1937, pp. 210-213 Practical. Advantages are shown by examples. Ha (7b)

The Gas Welding of Zinc and Zinc and Lead Coated Sheets. Obering W. Anders. *Welding Ind., London*, Vol. 5, Feb. 1937, pp. 49-50. See *Metals and Alloys*, Vol. 8, Aug. 1937, p. MA 490L/6. WB (7b)

Electric Arc Welding. *Electrical Rev.*, Vol. 120, June 25, 1937, p. 969. Abstract of memorandum issued by the Factory Dept., Home Office, England. Deals with precautions necessary to secure safety in arc welding. MS (7b)

Rightward Welding. *Mech. World Eng. Record*, Vol. 101, May 14, 1937, pp. 487-488, 490. Practical. The rightward method of welding gives an improved disposition of the rod and pipe, is economical of material, and leads to better, more uniform results. The procedure is explained in full detail. 9 illustrations. EF (7b)

Arc Welding of Aluminum (Die elektrische Aluminiumschweissung) H. Groebler. *Elektroschweissung*, Vol. 8, Mar. 1937, pp. 49-53. Review. Discusses the special chemical and physical conditions, and the personnel requirements necessary for satisfactory welding. Discusses methods of fluxing the oxides, stabilizing the arc, melting in the proper temperature range, controlling spec. gravity and production of an easily removable slag. The different types of joints and their execution, and the treatment and qualities of the weld are discussed. HR (7b)

Relation Between the Condition of the Weld and Its Mechanical Properties (Ueber die Abhängigkeit von Nahtbeschaffenheit und mechanischen Eigenschaften) G. Bierett (Staatl. Mat. Prüf. Amt, Berlin) *Elektroschweissung*, Vol. 8, Aug. 1937, pp. 148-152. Original research. Discusses the effect of the *kind* of stressing on the fatigue strength of butt- and fillet-welds and the production of defects as a function of the direction of stress. Reviews knowledge of the sensitivity to cracks and the danger of hardening stresses. The mechanical relations governing the strength of the welded zone are given. Hardening stresses are avoided not only by selection of suitable materials but by proper welding conditions. The danger of undesirable hardness distribution can be diminished by annealing. HR (7b)

Welding in Architectural Engineering and Bridgebuilding (Die Schweissung im Ingenieurhochbau und Brückenbau) G. Schaper. *Elektroschweissung*, Vol. 8, July 1937, pp. 121-125. Detailed review. 150 welded I-beam girder bridges have been constructed for the German State Railways and 246 for the highways. Materials-testing the behavior of the welded constructions, the execution and the advantages of the welds are discussed. Numerous examples of structures and projects are given. See also *Metals and Alloys*, Vol. 7, Apr. 1936, p. MA 191R/5. HR (7b)

Developments in Welding during 1936. Grover A. Hughes. (Truscon Steel Co.) *Iron Steel Engr.*, Vol. 14, Jan. 1937, pp. 61-62. Brief review of activities of Welding Research Committee of A. I. E. E. and A. W. S., educational developments, broadening of construction codes to include welded structures, and new welding machines. PP (7b)

Potential Distribution in the Welding Arc (Untersuchungen über die Spannungsverteilung im Schweisslichtbogen) H. von Conrady. *Elektroschweissung*, Vol. 8, July 1937, pp. 101-106. Theoretical. Discusses method of measuring the drop at the anode and at the cathode of heavy current arcs. HR (7b)

Approved Method for Repairing Furnace Crowns. H. C. Shepheard (Bur. Marine Inspection & Navigation) *Welding J., N. Y.*, Vol. 16, July 1937, pp. 27-28. Brief discussion and sketch. WB (7b)

Control of Quality of Welds (Die Prüfung der Güte von Schweissarbeiten) Th. Kampffmeyer (German Marine Dept.) *Elektroschweissung*, Vol 8, Sept. 1937, pp. 167-172. Review of methods especially practicable in shipbuilding. HR (7b)

Welding in Mechanical Engineering (Schweissen im Maschinenbau) K. Jurczyk (Georgsmarienhütte) *Elektroschweissung*, Vol. 8, Aug. 1937, pp. 153-155. Practical. Discusses means by which welding can be promoted and by which considerable savings in material are realized. HR (7b)

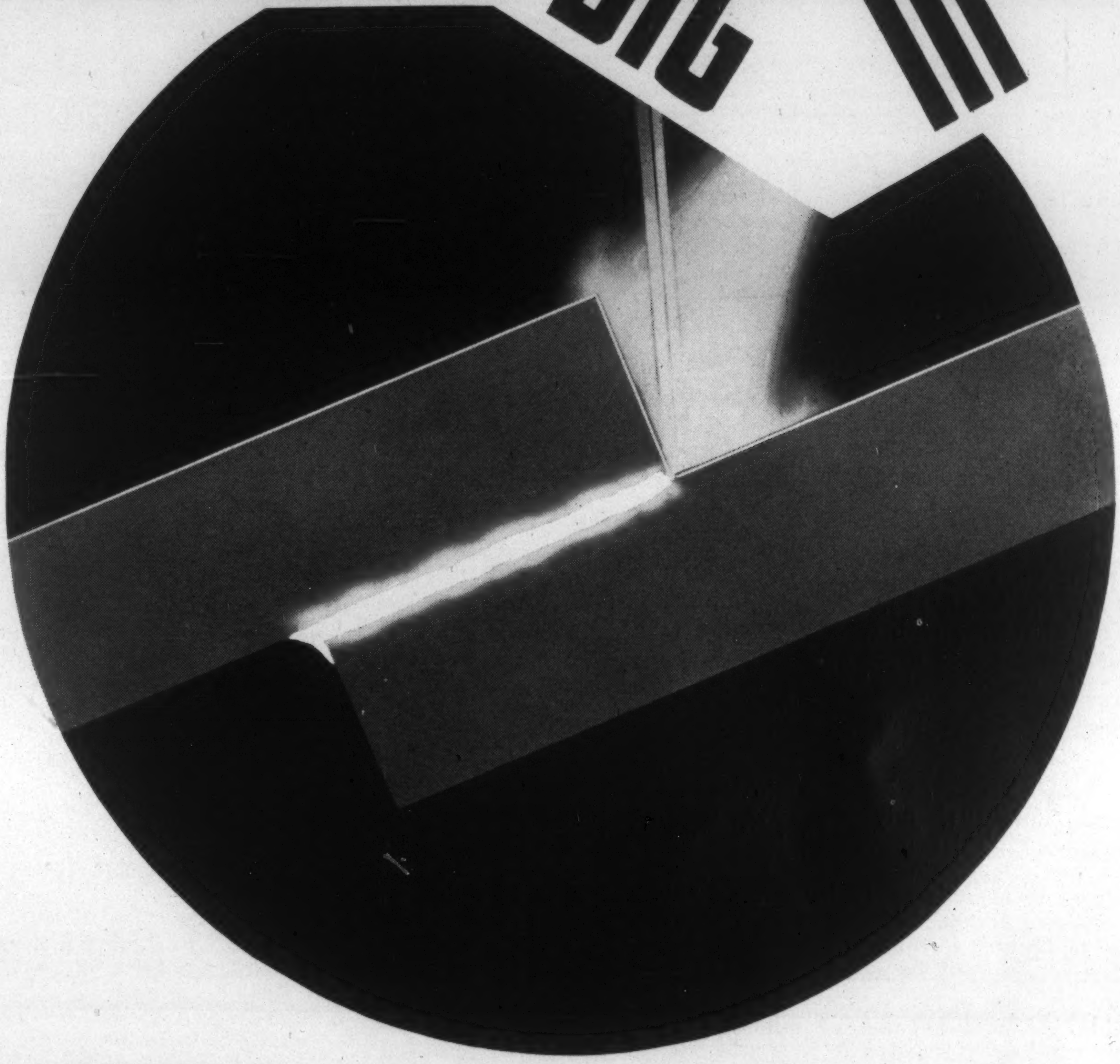
Repair of Damaged and Worn Parts of Red Brass by Electric Welding (Wiederherstellung von beschädigten oder abgenutzten Rotgussteilen durch die Elektroschweissung) Kohrs & Radon. *Elektroschweissung*, Vol. 8, July 1937, pp. 128-131. Practical. Discusses advantages, costs, electrodes of red brass and reliability of the method. HR (7b)

Fifty Years of Arc Welding in Germany (Fünfzig Jahre Lichtbogenschweissung in Deutschland) W. Adrian. *Elektroschweissung*, Vol. 8, Mar. 1937, pp. 47-49. Comprehensive historical review. HR (7b)

Design of Connections. H. C. Whittlesey. *Welding J., N. Y.*, Vol. 16, July 1937, pp. 17-23. Review and analysis of stresses and strength requirements in design of welded connections of various types. Some of the errors of design are discussed and illustrated along with the cure as given by the author and others. WB (7b)

Tentative Rules for the Qualification of Welding Processes and Testing of Welding Operators. *Welding J., N. Y.*, Vol. 16, July 1937, pp. 15-16. Clarification of previously issued tentative rules (see *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 154R/5.) WB (7b)

LOW TEMPERATURE
BRAZING ALLOYS "DIG IN"



Those who have never seen it before

are amazed at the action of brazing alloys containing a percentage of silver—

FIRST—by the extreme fluidity at temperatures as low at 1175° F.

THEN—by the powerful capillary force which quickly pulls the fluid alloy, into every crevice of a joint.

AND—by the strength which results from diffusion into metal surfaces.

These are not only interesting, but important facts, if you accept the evidence of thousands of manufacturers in all lines of industry who are getting *better* joints with silver brazing alloys at a net *reduction* in cost.

If you have ferrous or non-ferrous metals to join, try the low temperature brazing alloys—SIL-FOS and EASY-FLO—Use the low temperature HANDY FLUX with them. You can profit from the reliable joints they make in fast time with savings in gas, labor and finishing costs—Write us for details.

HANDY AND HARMAN · 82 Fulton St., New York
BRIDGEPORT, CONN. PROVIDENCE, R. I. TORONTO, CANADA

8 · FINISHING

Let Us Spray. B. C. GARDNER (DeVilbiss Co.) *Fab. Progress,* July 1937, pp. 127-129. Liquid spray guns. WB (8)

Protection by Metallic Coatings. A Report on Progress (Schutz durch Metallische Ueberzüge. Ein Fortschrittsbericht) A. KUTZELNIGG. *Korrosion u. Metallschutz,* Vol. 13, July/Aug. 1937, pp. 221-241. An exhaustive review of methods for overcoming losses due to rusting and corrosion. 289 references. Ha (8)

Surface Treatment of Aluminum (Oberflächenbehandlung von Aluminium) EUGEN WERNER. *Oberflächentech.,* Vol. 14, Aug. 17, 1937, pp. 164-165. Review. Production of various types of surfaces, pickling, etching, grinding and polishing methods are briefly discussed. Ha (8)

Steel Barrels Finished Under Well Controlled Conditions. J. B. NEALEY (Am. Gas Assoc.) *Iron Age,* Vol. 140, July 22, 1937, pp. 53-54, 122. Describes the plant of the National Barrel Co., Cleveland, with special reference to the method of finishing and the gas fired ovens used. VSP (8)

8a. Pickling

Rotary Mast-type Machine Pickles Hot-strip Steel at Low Cost. *Steel,* Vol. 101, July 19, 1937, pp. 68, 70. Industrial note describing pickler introduced by United Engineering & Foundry Co. and its operation. It has 3 tanks and a loading position arranged in a circle of 15 ft. radius. Mast in center of circle has cross-arms at top. At end of each arm is a rotating shaft having an acid-proof sprocket from which hangs an acid-proof chain. Mast is equipped for raising coils and rotating them progressively through arcs of 90°. Tanks are filled, respectively, with acid, cold H_2O, and hot soluble oil. Acid-proof mandrel is inserted through loosened coil and is attached to chains. Upon insertion in tanks, mandrel rotates slowly. Acid is circulated. MS (8a)

The Pickling of Steel: A Survey of Recent Work. T. P. HOAR. *Iron & Steel Ind.,* Vol. 10, Apr. 1937, pp. 340-343. Briefly discusses pickling and its mechanism, pickling defects, inhibitors, and electrolytic pickling. 32 references. CEJ (8a)

8b. Cleaning including Sand Blasting

Sodium Metasilicate. Its Properties and Uses. CHESTER L. BAKER (Philadelphia Quartz Co.) *Chem. Industries,* Vol. 40, May 1937, pp. 477-480. A survey of chemical and physical properties. The cleaning of metallic surfaces is discussed. RAW (8b)

8c. Polishing & Grinding

Nature of Lapped and Polished Surfaces. FRANCIS W. SHAW. *Machinery, London,* Vol. 50, June 24, 1937, pp. 389-392. Research. Emery, alundum and carborundum cut at almost the same rate. Carborundum maintains this rate better than alundum and still better than emery. With carborundum the lap wear is about twice as fast as with emery and with alundum about 1¼ times as fast. The rate of cutting is almost proportional to the pressure. The lap wear is in this ratio: cast Fe 1; mild steel 1.27; Cu 2.62; and, in general, is inversely proportional to Brinell Hardness. Cu and steel lap faster than cast Fe but the latter maintains its form better. Wet lapping is about 1.2 to 6 times as fas as dry lapping. JZB (8c)

Economical Die Maintenance Is Assured by Modern Machines. FRED B. JACOBS. *Steel,* Vol. 101, Aug. 9, 1937, pp. 36-38. Describes equipment and methods used by Truscon Steel Co., Youngstown, O., for grinding of stamping dies. MS (8c)

Industrial Abrasives (Les Abrasifs Industriels) CARTOUX *Usine,* Vol. 46, June 17, 1937, p. 33. Review of materials and methods of application. Ha (8c)

8d. Electroplating

Rust Protection (Ueber Rostschutz) III. H. ROTERS. *Mitt. Forsch.-Inst. Probieramts Edelmetalle,* Vol. 11, July/Aug. 1937, pp. 27-35. Review. Rust protection of the film obtained by immersion of the metal to be protected in a solution of salt of one of the nobler metals is discussed. Zn is deposited from acid and KCN baths; bright deposits are obtained by addition of colloids. Cd deposits can be made in the same manner, but only KCN baths are used in practice. Min. thickness should be 0.0075-0.01 mm. Corrosion of Zn deposits increases linearly with time, that of Cd layers with cube root of time; Zn should, therefore, have at least 0.015 mm. thickness. Sn can be deposited from any bath that contains Sn in only one ionic form, e.g. alkaline baths with quadrivalent Sn, operated at 75° C. Bright deposits are obtained by addition of acetate, gelatin, etc., to stannate baths. Electrolytic Pb deposits are obtained from fluosilicate, fluoborate, sulphophenolic and perchlorate baths at 20°-30° C., 1-3 amp./dens.^{3} current density. Deposits of Ni, Cr and Cu are mentioned. Al deposits can be obtained only from anhydrous electrolytes, either molten Al salts, or organic Al solutions. The salt baths work at 600°-800° C. with 0.5 amp./dm.^{2} and an Al anode. Procedures for all deposits are given and patents cited. 6 references. See also *Metals and Alloys,* Vol. 8, Sept. 1937, p. MA 562L/5. Ha (8d)

Bright Nickel Plating. L. W. JOHNSON. *Metal Ind., London,* Vol. 50, Feb. 26, 1937, pp. 281. Up-to-date review of the literature. 24 references. RWB (8d)

Testing and Stripping of Electrodeposits—Part I., Silver. B. EGEBERG & N. E. PROMISEL. *Metal Cleaning Finishing,* Vol. 9, Jan. 1937, p. 25, 12 pp. Practical. The protective value of electroplating can be judged by the results of various tests, such as those for thickness, porosity, adherence, flexibility and other characteristics of the coating. Of these tests, the one for thickness is probably most important but it is necessary to take the tests collectively to form a basis for sound judgment of the quality of the deposits. Methods for making these tests on Ag plated ware are discussed with formulas. For removing Ag from nickel-silver and other high Cu alloys the best solution consists of H_2SO_4, 19 parts and HNO_3, 1 part by volume at 176° F. Water must be kept out of this dip in order to minimize attack on the basis metal. Reverse current in 4-6 oz./gal. of NaCN is used for stripping Ag from Britannia metal, Sn, Fe, Ni and Ni plate. HNO_3 is used for deposits on stainless steel. Methods for measuring thickness and hardness are discussed in detail. GBH (8d)

Gold Plating Methods. W. A. KOEHLER. *Metal Cleaning Finishing,* Vol. 7, Dec. 1935, pp. 591-593. Practical review. Plating solutions are commonly made from the chloride of Au ($AuCl_3.HCl.4H_2O$). If this is treated with NaCN or KCN the corresponding double cyanide ($NaAu\ (CN)_2$) is formed. In dip gold plating articles of brass or Cu can be given a thin coating of Au by immersing in a solution composed of Au (as fulminate) 5 dwt./gal., Na_2CO_3 6 ozs./gal., NaCN 4 ozs./gal., Temp. 176° F. GBH (8d)

The Electrical Conductivity of Nickel-sulphur Electrodeposits. H. KERSTEN & W. T. YOUNG (Univ. Cincinnati) *J. Applied Phys.,* Vol. 8, Feb. 1937, pp. 133-134. Original research. Ni and S electrodeposited simultaneously under special conditions form an amorphous deposit containing 13% S. On heating to about 170° C. the electrical resistance decreases suddenly and Laue photographs show that the deposit has become crystalline with a structure similar to Ni_3S_2 reported by Alsen. HFK (8d)

Chevrolet Methods of Finishing Bumpers—An Example of Modern Efficiency. J. M. BONBRIGHT. *Metal Cleaning Finishing,* Vol. 8, Sept. 1936, pp. 543-547. Practical. The finishing of automobile bumpers for impact resistance as well as appearance is illustrated by the cleaning, polishing and plating of these parts at the Chevrolet Motor Company's plants at Detroit and Saginaw, Mich. Stock is pickled before polishing. Bumpers are given successive deposits of Ni, Cu, Ni and Cr. Care of polishing wheels is discussed. GBH (8d)

Progress in the Field of Plating Installations (Fortschritte auf dem Gebiete der Galvanisieranlagen) G. ELSSNER. *Korrosion u. Metallschutz,* Vol. 13, July/Aug. 1937, pp. 241-247. Descriptive. Ha (8d)

Electroplating Technique. *Machinery, London,* Vol. 50, June 17, 1937, pp. 349-351. Review. Comparison of British Cr and Ni plating technique with foreign practice. JZB (8d)

Nickel and Chromium Plating of Zinc Alloys (Vernickelung und Verchromung von Zinklegierungen) *Nickel Berichte,* Vol. 6, Nov. 1936, pp. 169-173. An illustrated review drawing heavily on the Report of Committee B-6 (Die Cast Metals and Alloys) of the A.S.T.M., June 1936, under the following headings: General Remarks, Pretreatment of Surface, Nickel Plating, Copper Plating, Summary of Successive Working Operations, Testing of Electroplatings, Durability of Ni and Cr Platings. Bath compositions and data on thickness of deposits are given. EF (8d)

Defects in Electroplating and Metal Coloring (Fehler beim Elektroplattieren und Metallfärben) HUGO KRAUSE. *Oberflächentech.,* Vol. 14, Apr. 6, 1937, pp. 73-75. General summary of the most common defects, as spotty appearance of the plated goods, brittle deposits, dull or wrong colors. The causes may be insufficient rinsing in clean water, too small baths, dirt in the bath, impurities in the materials used to make up the electrolyte, or insufficient degreasing. Ha (8d)

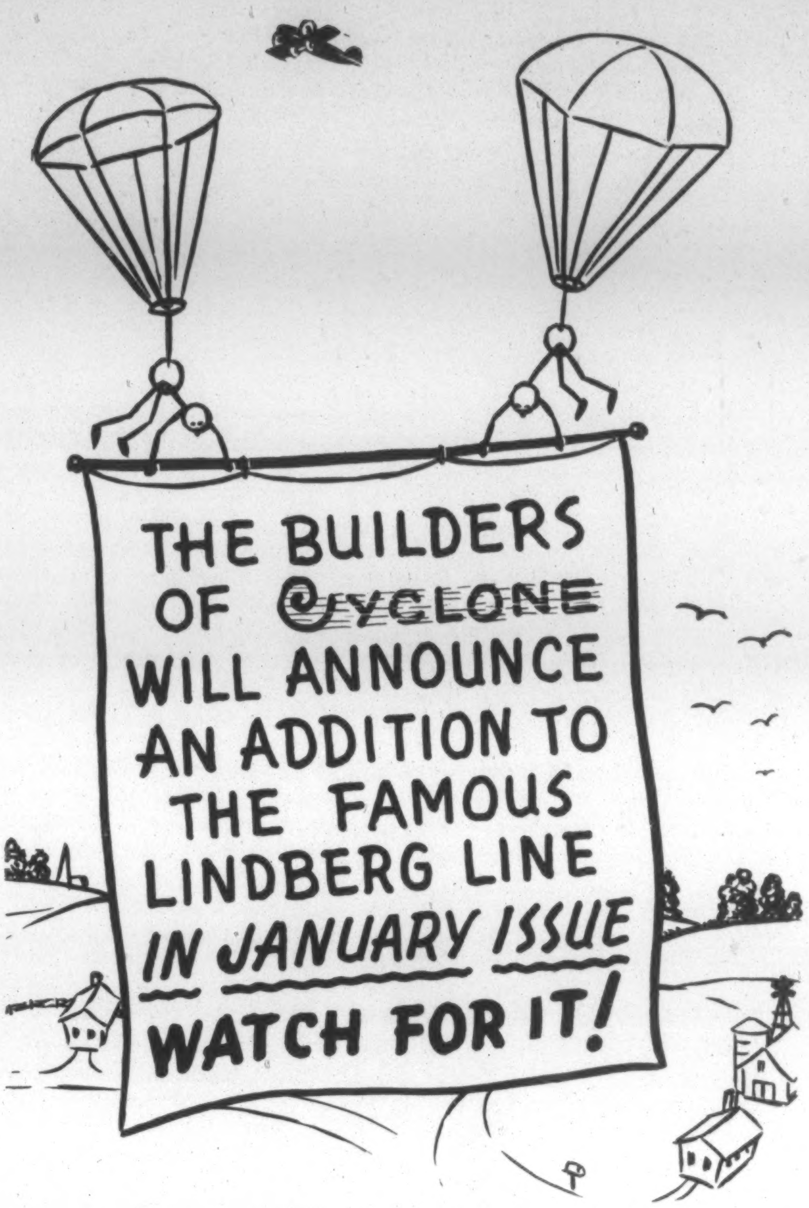
Rustproofing Process Involves Electrodeposition of Metal Alloy. *Steel,* Vol. 100, June 14, 1937, pp. 64, 66. Outlines "Oxoseal" process, trade name of a secret process. It is carried out at room temperature with tank voltage of 1-6 volts and current-density (d.c.d.) of 2-5 amps./ft.^{2} Thickness of coating varies from 0.0001 to 0.0005 in. and time of application from 5 to 15 min. Coating has silvery appearance and high corrosion resistance is claimed. Process said to have numerous uses. Composition of alloy and of bath are not stated. MS (8d)

Plating Economy Demands Control of "Drag Out" Losses from Plating Solutions. G. B. HOGABOOM. *Metal Cleaning Finishing,* Vol. 8, Oct. 1936, pp. 667-682; **Losses from Plating Solutions.** IBID., *Metal Ind., London,* Vol. 50, Feb. 12, 1937, pp. 219-222. Original research. Experiments to determine "drag out" losses from plating solutions are described. Cost figures are given for various plating solutions under various conditions, such as composition and temperature. Effects of size of article, addition agents in the solution and length of bottom edge were determined and optimum draining periods ascertained. Cost with respect to time of "drag out" is given graphically together with various tables and formulas. GBH (8d)

Electroplating on Lead-antimony Alloys. WALTER R. MEYER. *Metal Cleaning Finishing,* Vol. 8, Nov. 1936, pp. 751-756. The electroplating of Pb-Sb alloys with Cu, Ni and Cr is discussed. Procedure for cleaning and acid dipping is given. Micrographs illustrate the various conditions. GBH (8d)

Technical Properties and Control in Nickel Plating. R. J. MCKAY. *Metal Cleaning Finishing,* Vol. 8, Aug. 1936, pp. 461-464. Industrial note. The trend toward scientific control of Ni plating baths and of the conditions to produce certain desired properties in the plate is discussed. Among the factors covered are pH, current density, agitation, cleaning and oxidation. The properties of the plate such as thickness, brightness, hardness and crystal structure are elaborated. 3 references. GBH (8d)

Influence of Bath Temperature on Chromium Hardness. R. J. PIERSOL. *Metal Cleaning Finishing,* Vol. 7, Nov. 1935, pp. 535-537. Original. The solution contained CrO_3, 250, Boric acid 10, and H_2SO_4 2.6 gms./l. This was electrolyzed, lead anodes being used until trivalent Cr was 2 gms./l. and deposits were made at 115, 125, and 135° F. The relative abrasive hardness was determined by length of time required to cut through 1 mil of deposit. Curves given show increased hardness with increase of temperature: the time at 115° was 75 min.; 125°, 80 min.; 135°, 105 min. See also *Metals and Alloys,* Vol. 7, June 1936, p. MA 303L/1. GBH (8d)



RODINE

is cutting costs in 95 per cent of the country's pickling rooms.

RODINE

more than pays for itself. By its use, economies of 30 to 60 cents per ton of metal pickled are frequently gained.

RODINE

eliminates pitting of the metal. Minimizes acid brittleness. Reduces rusting of pickled stock.

RODINE

makes pickling operation easily controlled and gives consistent results.

AMERICAN CHEMICAL PAINT CO.
AMBLER PENNSYLVANIA
Detroit
6339 Palmer Ave. E

Electrodeposited Coatings as Corrosion Preventives. S. Wernick. *Metal Cleaning, Finishing,* Vol. 9, Apr. 1937, p. 293, 5 pp.; *Chem. Trade J.,* Vol. 99, Sept. 18, 1936, pp. 237-238; *Electrical Rev.,* Vol. 119, Sept. 25, 1936, p. 405. General discussion. The unusual properties of Zn and Cd electrodeposits, and of anodized Al that make them important factors in the fight against corrosion are reviewed. Control of operating conditions and applications are discussed. GHB + MS (8d)

Cost Determination and Route Planning in a Job Plating Plant. C. B. F. Young & A. Lakos. *Metal Cleaning Finishing,* Vol. 8, Nov. 1936, pp. 757-760. Practical trade note. The authors have devised a system whereby (1) the exact cost of finishing an article and (2) a method of routing the work through the plant can be obtained. Practical success is claimed for this system in the plants where it has been installed. Facsimiles of records and planning cards are shown. GBH (8d)

Plating of Zinc from Ammonium-sulphate-zinc baths. R. R. Rogers. *Metal Cleaning Finishing,* Vol. 9, Apr. 1937, pp. 277-280. Original research to determine the composition of various baths from which Zn can be deposited from a clear solution. The optimum conditions of temperature and current density under which the best looking deposits are produced were determined in 8 typical baths. Ternary diagrams Zn-NH_4-SO_4 are given, also table of experimental data. GBH (8d)

Value of the Microscopic Method in Studying Electrolytic Deposits (Sur la Valeur de la Méthode Microscopique pour l'Étude de la Structure des Dépôts Électrolytiques) Pierre Jacquet. *Compt. Rend.,* Vol. 204, May 3, 1937, pp. 1320-1322. General discussion. Authors assert that, while electron diffraction methods give information concerning the structure of electrolytic deposits, yet a microscopic examination is also valuable in a study of the entire surface of the electrode. FHC (8d)

Electrodeposition of Molybdenum. *Metal Ind., London,* Vol. 50, Jan. 1, 1937, p. 18. Résumé of paper presented before *Electrochem. Soc.* by Price & Brown. Molybdic anhydride (MoO_3) and H_2SO_4 gave satisfactory deposits under certain conditions. A solution of MoO_3 in H_2SO_4 was submitted to a preliminary reduction with a current of 2.0-2.5 amp. for about 100-120 hrs. using Pt. electrodes. Subsequent electrolysis at a current density of 36 amp./dm.^{2} yielded smooth gray deposits. Under the conditions employed no deposit was obtained at a current density below 21 amp./dm.^{2} and above 40.0 amp./dm.^{2} a rough deposit was formed. A Cu cathode and Pb anode were used. The bath was operated at 50°-55° C. RWB (8d)

8e. Metallic Coatings other than Electroplating

The Formation of Hot-galvanized Coatings (Beitrag zur Entstehung des Feuerverzinkten Ueberzuges) H. Bablik. *Korrosion u. Metallschutz,* Vol. 13, July/Aug. 1937, pp. 248-254. Experimental. Although the formation of a coat of Zn on Fe by hot-galvanizing depends mainly on duration and temperature of immersion, certain other factors must be considered. These were studied from the viewpoint of the Fe-Zn diagram, and a great number of micrograms show the change in structure in the intermediary layers between Zn and Fe (steel) with the change of external conditions. Diffusion conditions are discussed, and the work of other investigators reviewed. Definite conclusions can not yet be drawn. 21 references. Ha (8e)

Correct Metal Spray Procedure. A. H. Yoch (Air Reduction Sales Co.) *Steel,* Vol. 100, May 3, 1937, p. 67. Practical. In restoring worn shafts to original diam., shaft is reduced by rough turning and is then blasted with sharp angular steel grit. It may also be turned so as to leave a jagged, torn surface. Metal is then applied in continuous overlapping bands. Best metals for coating are 0.80% C steel and a special, hard, stainless steel. MS (8e)

Impregnated Metal Equipment. *Chem. & Met. Eng.,* Vol. 44, Jan. 1937, p. 32. Brief description is given of the results of Ihrigizing in which a cheap ferrous base metal is impregnated with silicon up to 14%. PRK (8e)

Spray Coatings of Aluminum-magnesium Alloy on Other Metals (Aluminium-Magnesium-Metall-Spritzüberzüge auf anderen Metallen) W. Erdmann. *Aluminium,* Vol. 19, June 1937, pp. 385-387. Descriptive. Spraying of hydronalium (Al-Mg alloy) has proved to be particularly successful for coating heavy metals, because of its corrosion resistance and ability to take a high polish. It is used in wire form, less conveniently in powdered form. Ha (8e)

The Composition of the MBV Layer and the Change of Its Properties with Increasing Duration of Immersion by Heating and Aging (Ueber die Zusammensetzung der MBV-Schicht und die Veränderung ihrer Eigenschaften mit zunehmender Tauchdauer durch Erhitzen und Altern) W. Helling (Aluminium-Werke A.G.) *Aluminium,* Vol. 19, June 1937, pp. 375-381. Original research. The protective layer produced on pure Al sheet (rolled) by 10 min. treatment with chromate consisted of 73% $Al(OH)_3$, 25% Cr $(OH)_3$, and the remainder Na and Si. [M.B.V. (Modified Bauer Vogel) process is one of anodic oxidation, details of bath composition not available. Bath contains Na chromate as one constituent. The Si reported above in the coating comes from the metal treated. H.S.R.] The thickness of the layer increases with increasing duration of immersion while the surface becomes rougher and more porous. The absorption susceptibility towards lacquers and some organic paints increases with the thickness of the layer, while the effect of the thickness on corrosion resistance depends on the nature of the attacking solution. If the layer is annealed, color, hygroscopicity, ability to absorb organic paints and sodium silicate, and resistance to attack by NaOH and HCl are changed. Aging in air also increases the resistance to 10% NaOH and HCl. Tests described in detail. 10 references. Ha (8e)

8f. Non-Metallic Coatings

Metal Changes During Enameling. R. B. Schaal (Ferro Enamel Corp.) *Foundry,* Vol. 65, Apr. 1937, pp. 52-53, 148. *Steel,* Vol. 100, June 7, 1937, p. 72-73, 90. Discusses the annealing effect of firing on vitreous enameled castings. No changes in composition are evident, except alteration in proportions of combined C and graphite. Illustrates general trend in structural change upon enameling 1/8 in. section castings by the wet process. Includes a number of photomicrographs and gives chemical analysis of castings suitable for enameling. VSP + MS (8f)

A Resumé of Some Studies on Sheet Steel Ground Coat Enamels. R. M. King. *Eng. Experiment Sta. News, Ohio State Univ.,* Vol. 9, Apr. 1937, pp. 9-11. Original research. A study was made of the metal-enamel interface. Methods of investigation are described. It was found that the use of Co oxide is particularly suitable to form a firm bond between Fe and enamel and aids in adjusting the coefficient of expansion of the enamel to that of the metal. Conditions and practical problems connected with the application of Co-bearing ground coats are discussed at length. Ha (8f)

Application of Gas Radiant Tubes to a Continuous Porcelain Enameling Furnace. Geo. M. Parker (Mississippi River Fuel Corp.). *Ind. Heating,* Vol. 4, July 1937, pp. 556-557. General description of the installation, which increased production 70% over former arrangement. Ha (8f)

Twenty-inch Line Is Coated in the Field. W. H. T. Thornhill (Wailes Dove-Hermiston Corp.) *Oil & Gas J.,* Vol. 36, June 24, 1937, pp. 57, 123-124. 20 miles of line were coated with Bitumastic 70-B Enamel followed by an unbonded Johns-Manville 15-lb. coal tar saturated pipe line felt. The unique features of this job were: coating of the entire line on the job; use of a new endfeed pipe coating machine; application of the hot enamel only at the storage yard, wrapping being applied later in the field; testing of the pipe coating with a "holiday" detector in the storage yard and again in the field just prior to the application of the wrapping. VVK (8f)

Surface Treatment of Magnesium and Magnesium Alloys (Die Oberflächenbehandlung von Magnesium und Magnesiumlegierungen) F. Lohmann. *Oberflächentech.,* Vol. 14, July 6, 1937, pp. 11-13. Descriptive. The difficulties of "anodizing" Mg and its alloys are discussed. Unlike Al, where the natural and artificially formed oxide layers are dense because of the greater volume of the layer than of the metal, the Mg oxide layer is porous as the volume is smaller than that of the metal; cracks are formed in the contraction and no protective action can be exerted. Non-metallic protective layers on Mg are made (1) of oxide layers, preferably MgO, (2) fluoride layers, preferably MgF_2, (3) other protective layers, e.g. Se or Mg selenide. These layers can be produced chemically or electrochemically. Anodic oxidation, which is so successful with Al, has been much less so with Mg as the metal is either attacked in such baths or the deposits are unsightly. Alkaline anodic treatment results in formation of a white oxide layer on Mg, which is thin and porous and needs subsequent treatment, e.g. coating with a lacquer. The various methods are discussed at length, and a number of patents described. 31 references. Ha (8f)

9·TESTING

New Method for the Study of Crystallization of Metals and Alloys. L. Edelson. *Metallurg,* Vol. 12, Apr. 1937, pp. 142-145. In Russian. In many instances the separation of liquid from solid phases is important. A centrifugal device is described which permits the separation of phases at elevated and steadily maintained temperatures. (9)

The Use of the Polarograph in Ferrous Metallurgical Laboratories (Die Anwendung des Polarographen im Eisenhüttenlaboratorium) G. Thanheiser & G Maassen. *Naturwissenschaften,* Vol. 25, June 25, 1937, pp. 426-429. Practical. Instructions for the use of a polarograph in steel laboratories to make a rapid quantitative determination of Cu, Ni and Co in Fe alloys. Common elements present in steel do not interfere. JZB (9)

9a. Inspection & Defects, including X-Ray Inspection

C. S. BARRETT, SECTION EDITOR

Means for and Examples of Application of Technical X-ray Irradiation (Hilfsmittel und Anwendungsbeispiele für die Technische Rontgendurchstrahlung) E. A. W. Müller (Siemens & Halske A.-G.) *Siemens-Z.,* Vol. 17, Aug. 1937, pp. 449-454. Practical. Methods and equipment for examination of materials, castings, and welds are described. Ha (9a)

Special Requirements in Lighting for the Inspection and Finishing of Metals (Besondere Anforderungen an die Beleuchtung bei der Prüfung und Bearbeitung von Metallen) K. Wernicke. *Metallwirtschaft,* Vol. 16, Aug. 13, 1937, pp. 818-819. Practical. Describes lighting conditions and especially the application of Hg vapor and Na vapor lights in the inspection of sheet. GA (9a)

A Zeiss Direct-measuring Instrument. *Wild-Barfield Heat-Treatment J.,* Vol. 2, Mar. 1937, pp. 55-58. Descriptive. Inspection gages for machine tool work are checked with the Zeiss Ultra Optimeter, which provides rapid, direct readings, constant measuring pressure independent of the operator, and indefinite retention of accuracy. FPP(9a)

X-ray Determination of the Wall Thickness of a Brewing Tank (Röntgenographische Wandstärkebestimmung an einer Braupfanne) W. Engelhardt (Osnabrücker Kupfer- und Drahtwerk) *Mitt Forsch-Anstalt. Gutehoffnungshütte, Oberhausen A.-G.,* Vol. 5, May 1937, pp. 88-94. Descriptive. In order to check the wall thickness of large Cu bottoms of brewing tanks of more than 5 m. diam. during the manufacturing process (all by hand) an arrangement was devised by which the blackening of photographic plates by X-rays passing through the metal was used in comparison with blackening by direct radiation. The apparatus is described in full. Ha (9a)

9b. Physical & Mechanical Testing

W. A. TUCKER, SECTION EDITOR

The Internal Stresses in a Quenched Cylinder (Die Verteilung der Eigenspannungen in einer abgeschreckten Welle) U. Dehlinger (Kaiser-Wilhelm Inst.) *Metallwirtschaft,* Vol. 16, Aug. 20, 1937, pp. 853-854. Theoretical discussion. Reviews the work of Kurdjumow and Scheldak (see *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 223L/4) who, measuring internal stresses in quenched cylinders by the Sachs boring out method and by X-ray back reflection technique, could not reconcile the two methods. Kurdjumow and Scheldak applied Sachs' formulas to the cylinder ends whereas they should be applied only to the interior of a long cylinder. Considering the theory of elasticity, a picture is drawn of the stresses at the ends of a quenched cylinder which conforms with the X-ray results of Kurdjumow and Scheldak. GA (9b)

Yield Point of Structural Steel, Report of A.S.T.M. Research Committee. M. O. Withey, Chairman. *Am. Soc. Testing Materials,* Preprint for June 1937 meeting, 14 pp. The purpose of the committee is to consider (a) the significance of the yield point to the engineer, (b) the range in the yield point when the material is furnished under specifications, and (c) the testing procedure which will insure sufficiently accurate determination of the yield point with a minimum of expense. Results of a questionnaire sent out in 1933 on (a) are given. The purpose of these tests was to determine the effect of aging on the yield point of structural steel rods. Specimens of .24% C and .17% C-.30% Cu steel were sent to five laboratories. The tests indicate that the effect of age on yield point and tensile strength of hot-rolled structural steel of the grade used is small. The yield point showed an average reduction of approx. 2% between 1 day and 1 mo. with little or no change thereafter, the tensile strength increased slightly. There is a material improvement in ductility as evidenced by an average increase of 30% in reduction of area and 8% in percentage elongation in 8″ between ages of 1 day and 180 days. Most of this increase in ductility took place within the first month. Some conclusions from the work of the committee were: The yield point in tension is a reliable index of the yield point in compression for hot-rolled structural steel. It is not possible to predict accurately the yield point from the ultimate strength, since the ratio of yield point to tensile strength varied from 0.49 to 0.64 for the whole shapes tested and only about half of the shapes had ratios of yield point to tensile strength within 5% of the mean ratio. Recommendations of the committee included the following. The speed requirement for the determination of the yield point based on the speed of head running free be discarded and in the vicinity of the yield point the rate of pulling shall be limited by rates of strain or by rates of stress. Tentatively for wedge grips and an 8″ gage length the suggested max. limit for the rate of strain in the vicinity of the yield point is 0.0015 in. per in. per min. which would correspond to a stress limit of 45,000 lb./sq. in./min. Machines should be accurate within 1% in the load range at which the yield point and ultimate strength are determined. The drop of beam or halt in motion of the pointer on the dial are sufficiently accurate methods of determining the yield point in practically all cases. VVK (9b)

Analysis of the Brinell Hardness Test. R. H. Heyer (Am. Rolling Mill Co.) *Am. Soc. Testing Materials,* Preprint for June 1937 meeting, 23 pp. Original research. By means of a split test specimen clamped together, stress distributions were determined for a number of materials including Armco Fe, mild steel, 20% Cr, 18-8, Monel metal, Herculoy, brass, Alcoa, Dowmetal, Zn, and Al. General observations were summarized as follows: The maximum compressive deformations occurred somewhat below the surface of the impressions rather than at the surface. The sinking-in types of hardness impressions are produced by relatively large underlying shear deformation. The ridging types of impressions are produced by relatively large surface compressions. In most cases, the sinking-in types of impressions were associated with relative weakness in shear, as measured by the ratio of shear to compressive yield strength. The ridging types of impressions were associated with a high ratio of shear to compressive yield strength. Direct measurements of plastic deformation in thick hardness test specimens indicated that permanent distortion occurred at a depth greater than some of the minimum thicknesses of hardness test specimens recommended in the past. It is possible that the practical effect of such underlying distortions on the measurements of the impression are negligible. However, if accurate requirements for minimum specimen thickness are to be set up, the type of impression (sinking or ridging) should be considered. It was shown that the depth of visible distortion increased, and the rise of metal above the original surface decreased, as the Meyer N coefficient was increased by annealing cold-drawn Herculoy at progressively higher temperatures. These relationships are capable of rather general application. The change from a ridging to a sinking type of impression occurs at about N = 2.25 to 2.30. Plastic deformations produced under a cylindrical indentor (load applied normal to the axis of the cylinder) indicated higher shearing stresses and deeper penetrations than occur under a ball. A method was proposed for expressing a shear yield strength having an arbitrary but logical relationship to the tensile or compressive yield strength. VVK (9b)

Examination of a Method of Cupping by the Jovignot Fluid Pressure (Étude d'une Methode d'Emboutissage par Pression d'un Fluide, Préconisée par Ch. Jovignot) PAUL BASTIEN. *Rev. Mét.*, Vol. 34, May 1937, pp. 339-346; *Sheet Metal Ind.*, Vol. 11, Aug. 1937, pp. 730-732, 744; *Iron Age*, Vol. 140, Sept. 16, 1937, pp. 51-55; Sept. 30, 1937, pp. 29-31. Among advantages inherent in liquid pressure methods of testing ductility are: coefficient of ductility is expressed as increase per unit of area; the impression formed has a truly semispherical shape; there is no necessity for keeping the plunger lubricated; clear indication of the point of failure and of the directional properties of the metal is given by the appearance of the failure. The disadvantages are: the lack of participation of the metal closely adjoining tightly fitting grips in total deformation, and the difference of the deformation mechanism from that encountered in practice. Several methods, both of liquid pressure and the usual mechanical types, were compared. JDG + AWM + VSP (9b)

Use of Light Interferences in Technical Measurements (Verwendung von Lichtinterferenzen in der Technischen Messung) TH. ZOBEL. *Z. Ver. deut. Ing.*, Vol. 81, May 29, 1937, pp. 619-624. The principles of measurements by means of optical interferences are explained, and application and instruments developed for thermodynamic and flow measurements described. 11 references. Ha (9b)

Equipment for Routine Creep Tests on Zinc and Zinc-base Alloys, and an Example of Its Application. J. RUZICKA (N. J. Zinc. Co.) *Metals Tech.*, Vol. 4, Apr. 1937, T.P. 806, 16 pp. Original research. Equipment for routine creep tests on Zn and its alloys is described. The equipment is compact, cheap, simple in operation, and has adequate accuracy. Representative data obtained with this equipment on a group of rolled Zn-base materials are given. The value of the tests is illustrated by comparing them with ordinary tensile tests on the same materials. JLG (9b)

Influence of the Thickness of Flat Tensile Specimens on their Tensile Strength. S. KUSHAKEVICH. *Metallurg*, Vol. 12, Feb. 1937, pp. 86-92. In Russian. Original research. Cu sheets were cold deformed by rolling to a different extent, cut into tensile specimens and tested. A mathematical expression connecting the degree of cold deformation with the changes of tensile strength is developed corresponding to a polytropic curve. The calculated data agreed with experimental evidence. (9b)

9c. Fatigue Testing

H. F. MOORE, SECTION EDITOR

The abstracts appearing under this heading are prepared in cooperation with the A.S.T.M. Research Committee on Fatigue of Metals. The purpose of this cooperation is to make readily available complete references to the literature of this subject. The Committee does not necessarily subscribe to the statement of either the author or the abstractor.

Fatigue—Internal Pressure Experiments on Lead-antimony Alloys (Dauer- Innendruckversuche an Blei-Antimon-Legierungen) FRHR. VON GÖLER (Metallgesellschaft A.G., Frankfurt/M) *Metallwirtschaft*, Vol. 16, Aug. 6, 1937, pp. 797-801. Research. Lead pipe containing 0, 0.5, 1.0, and 1.5% Sb was filled with N_2 under pressure and the time for splitting in relation to the original pressure was noted. Some of the experiments extended over 2 yrs. In short time experiments, with pressure applied until pipe bursts, the tangential stress necessary for failure corresponds to the tensile strength. In tests of longer duration the stress for failure decreased as a function of the logarithm of time. [This is in harmony with results obtained at the Univ. of Ill. in 1935.—H.F.M.] Addition of Sb raises the breaking strength in short time tests but in the long time tests the stress necessary for failure does not seem to be influenced by Sb content. Author investigated and made certain that his results were not affected by aging. GA (9c)

The Development of Cracks in the Wheel Seats of Axles with the Hubs of Wheels. GEORGE WALTER CANSDELL HIRST. *J. Inst. Engrs., Australia,* Vol. 9, June 1937, pp. 215-228. A description of how a fatigue failure of an axle may develop in an unexpected location. The effect of radial pressure upon the wheel seat from the hub of the wheel is to induce in the wheel seat a tensile stress approximately half that of the radial pressure, so that there is in the surface of the axle an alternating stress due to bending under the applied load, together with a continuous tensile stress. The reason for the presence of the induced stress is given, also mathematical evidence of the benefit derived from arranging conditions so as to avoid it. WHB (9c)

Degree of Fatigue of Carbon Steels under Repeated Bending. FUMIO OSHIBA. *Kinzoku-no-Kenkyu*, Vol. 14, Mar. 1937, pp. 96-106. In Japanese. Original research. Fatigue tests by Honda's method were made on some Swedish C steels. (1) In the case of a specimen of uniform diam., the degree of fatigue progresses at a diminishing rate, under a constant intensity of stress, as the number of repetitions increases, and the final value attained at the instant of breaking of the specimen becomes less as the intensity of stress decreases; under a low stress, such as the endurance limit, the degree of fatigue becomes almost constant in the later stages of stress repetition. In some steels, the fatigue reaches a high value even below the endurance limit. The true endurance limit may be defined as a stress below which the fatigue effect becomes no worse at a definite number of stress repetitions. (2) In the case of a notched specimen, the degree of fatigue progresses first slowly, then quickly and finally again slowly, as the number of stress repetitions increases. The rapid progress of fatigue is due to minute cracking. A safe working stress for an actual machine element, which has abrupt changes in its sectional dimensions, may easily be found by determining a stress intensity which causes no rapid progress of fatigue. (3) Concerning the change of the impact value of a fatigued material, two factors, grain size and minute fissures, were pointed out and the effect of each factor was discussed. See *Metals and Alloys,* Vol. 6, July 1935, p. MA 291R/4. KT (9c)

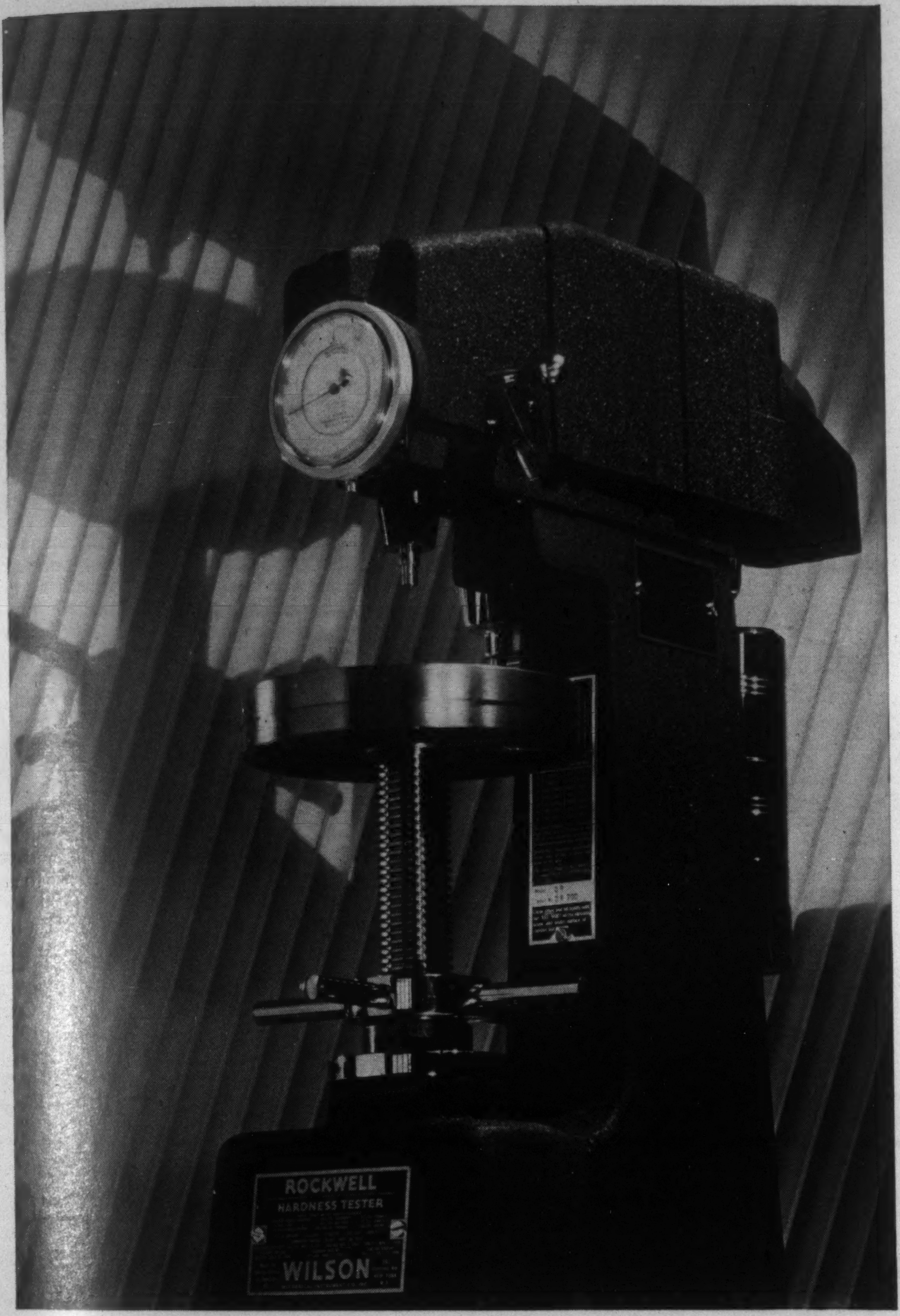
Experiments on Torsional Vibration Strength of Offset, Notched and Bored Shaft (Versuche über Drehschwingungsfestigkeit abgesetzter, genuteter und durchbohrter Wellen) W. HEROLD. *Z. Ver. deut. Ing.*, Vol. 81, May 1, 1937, pp. 505-509. A general review of work dealing with the effect of notches and changes of section on fatigue resistance and report of recent investigations with numerical data for 7 different steels. 19 references. Ha (9c)

Rotating Fatigue Bending Machine with Hard Loading Spring (Umlauf-Dauerbiegemaschine mit harter Belastungsfeder) W. SPÄTH. *Z. Ver. deut. Ing.*, Vol. 81, June 19, 1937, pp. 710-712. Original research. Elucidates the relation between the elastic properties of the testing machine and the test results. Results obtained on Al and steel samples with a special machine do not tally exactly with those of ordinary machines, but the differences may be due to changes in the sample from original state to that produced during the fatigue tests. Ha (9c)

9d. Magnetic Testing

L. S. REID, SECTION EDITOR

The Magnetic Quality of Cobalt, Nickel and Iron. The Effect upon It of Heat and Electric Current. T. F. WALL. *Engineer*, Vol. 163, Apr. 2, 1937, pp. 397-398. Original research. Investigations were made on the effect on the max. permeability of ferro-magnetic substances when a high temperature was maintained in H and at the same time carrying an electric current at high density. A length of wire was placed in a metal cylinder having a glass window through which temperatures were measured with an optical pyrometer. H passed slowly through the cylinder. The wire was arranged so that an electric current could be passed through and the temperature of the wire raised by adjusting the current density. In the case of Co a thermostatic control switched the current off when the max. temperature was reached and on when it had fallen by about 200° C. The time for which the current flowed depended upon the current density. When the Co wire in the annealed state was flashed in H to 1200° C., the max. permeability was raised from 100 to 340. When an alternating current was passed through the wire the max. permeability fell rapidly during the first stages but after 2½ hrs. the rate of fall was greatly reduced. When the current was increased the rate of fall was greatly increased over that produced when the lower current of 250 amperes was used. After 4 hrs. treatment max. permeability became steady showing that current density has a marked effect on max. permeability which cannot be accounted for as a purely temperature effect. Still greater currents further reduced the max. permeability. It was impossible to carry out similar tests with Ni as the wire became too soft and pliable to operate the thermostatic control. Max. permeability after treatment was 1400 whereas the previous highest value was only 1120. Ni was found to be much less sensitive to treatment than Co, in so far as the rate at which max. permeability changes. In the case of Fe it was found that the max. permeability rises at a much slower rate than does Ni. The highest value obtained was 3500. LFM (9d)



Model 3-R with Cowl and Testing Table

"ROCKWELL" HARDNESS TESTER

for ferrous and non-ferrous metals

*made
only
and
always
by*

WILSON
MECHANICAL INSTRUMENT CO., INC.

WHAT IS REQUIRED TO MAKE A GOOD HARDNESS TESTER

PRACTICAL purposes require that the test must be non-destructive. Experience has shown that indentation hardness tests are most informative, yet to be non-destructive the indentation must be very minute. The machine should cover a wide range of hardness and must reveal highly readable differences for small differences in hardness.

Consider those requirements well and you must grant, first, that hardness measurement is a micrometric job and, second, that accuracy in micrometric measurement is attainable only with apparatus faithfully made by precision methods on precision equipment by experienced instrument makers. It is no ordinary machine shop job. Years of evolution, experience and reputation for fine workmanship are behind and in the "ROCKWELL."

WILSON MECHANICAL INSTRUMENT CO., INC.

733 EAST 143rd ST. **NEW YORK**

10 · METALLOGRAPHY

J. S. MARSH, SECTION EDITOR

Transformation of Manganese. H. YOSHISAKI. *Kinzoku-no-Kenkyu,* Vol. 14, Mar. 1937, pp. 91-95. In Japanese. Original research. Transformation of Mn was studied, using distilled Mn by means of differential thermal analysis, dilatometry and buoyancy method. The last method consists in ascertaining a temperature at which the weight of a sample, dipped in a molten salt bath, changes abnormally during heating and cooling. Mn melts at 1254° C., and has three transformations: at 1150°, 1087° and 706° C. The volume changes during the transformation are given. KT (10)

Modification and Transformation of Metals by Heating in Vacuum or in Different Gases (Modification et Transformations de Métaux, par Chauffage dans le Vide ou dans Differents Gaz) JEAN J. TRILLAT & S. OKETANI. *J. Phys. Rad.,* Vol. 8, Feb. 1937, pp. 59-66; Mar. 1937, pp. 93-98. Original research. Electron diffraction studies were made of the changes in Au, Au alloys, Ag, Pt, Cu, and Al on heating at various temperatures in a vacuum, in inert gases and in air. Most of the work was concerned with Au and Ag. A new modification of Au appears on heating the metal above 550° C. either in vacuum, N_2, A, O_2 or air. The new modification (called "B" Au) always appeared first in the thinnest regions of the Au foil. Au films examined by transmitted light maintain the same green color up to 550° C.; Au films annealed for 2 hrs. above this temperature become brownish-yellow. The change is attributed solely to thermal modification, as the "B" diagram was the same whatever the environment, including vacuum, and the possibility that the change is due to impurities is called untenable. The "B" form of Au is hexagonal; its formation is interpreted on the basis of the mobility of the surface atoms of the metal, and its practical importance with respect to adsorption and catalysis is indicated. A new modification of Ag was similarly observed, on heating above 520° C. 24 references. FPP (10)

Aluminum Corner of the Al-Cu-Mg System. HIDEO NISHIMURA. *Nippon Kinzoku Gakukai-Si,* Vol. 1, May 1937, pp. 8-18. In Japanese. Original research. The constitution of the Al-rich alloys containing Cu and Mg was investigated thermally and microscopically. From various sections taken at constant Al content or through the Al axis, the following conclusions were drawn: (1) alloys containing 50% Cu and 40% Mg the phases are (Al), $CuAl_2$, S, T, β and X, where S and T, in equilibrium with (Al), denote $Al_{13}Cu_7Mg_8$ and Al_5CuMg_4 respectively, β is an intermediate phase existing between Al and Mg, and X is an unknown phase not determined in this investigation. (2) Compounds $Al_{13}Cu_7Mg_8$ and Al_5CuMg_4 were identified. (3) The reaction lines and points were clearly established. (4) Natural aging of duralumin and 24S-type alloy is mainly concerned with the solid solubility change of S-compound and $CuAl_2$ or that of S-compound in Al. KT (10)

Grain Size Determination by Oxidation Method. P. GRUZDOV & I. FEDORCHENKO. *Kach. Stal,* Vol. 5, No. 3, 1937, pp. 40-46. In Russian. Original research. Heating steel in air results both in surface oxidation and O diffusion into the metal particularly along grain boundaries. In the outer layers this diffusion results in formation of Fe oxide along grain boundaries; in the inner, in decarburization only. A metallographic specimen prepared so as to preserve the outer oxidized layers of steel would offer in this case an accurate picture of the grain size which the steel had at the oxidizing temperature. Specimens are ground and polished with 00 paper and heated in a muffle furnace at the desired temperature. They are quenched and polished starting with 00 paper after which they are examined in the usual way after etching with picric acid. A lengthy investigation of grain size produced under varying conditions and illustrated by many photomicrographs shows the reliability and speed of this method, which is free from disadvantages connected with the McQuaid-Ehn test. The process is applicable practically to any type of steel. (10)

Constitution of High-purity Iron-carbon Alloys. ROBERT F. MEHL & CYRIL WELLS (Carnegie Inst. Tech.) *Metals Tech.,* Vol. 4, June 1937, T.P. 798, 41 pp. Original research of great precision. About 60 homogeneous, high-purity Fe-C alloys, 0 to 1.4% C, were prepared by gas carburizing Fe in dipentene-H_2 and dipentene-benzene-H_2 mixtures. These alloys were studied by dilatometric, thermal, magnetic, and microscopic methods. For the first 2 methods constant rates of heating and cooling of 2, ½, and ⅛° C./min. were used. Transformation temperatures, Ar_3 and Ac_3, Ar_1 and Ac_1, and Ac_{cm} and Ar_{cm}, were determined, and information was obtained on degrees of superheating and undercooling in the metastable system. Extrapolation of dilatometrically determined transformation temperature data to zero rate of heating and cooling is discussed. The A_3 and A_1 temperatures determined by extrapolation of dilatometric data are believed to be accurate to within 2° C., and to within 1° C. at the slowest rate. The dilatometer is not very useful in determining A_{cm} temperatures for alloys with less than 1% C. The eutectoid is at 0.80% C ± 0.01%. The A_1 temperature is 723° C. ± 2° C. The A_{cm} line was determined from microscopic results and believed to be accurate within 3° C. The temperature at which alloys lose their magnetism is constant up to the point at which the Curie and A_3 temperatures coincide and is 775° C. No evidence was found of the Curie transformation occurring in the austenite field. JLG (10)

An Investigation of the Iron-carbon Constitutional Diagram. Part I.—Preliminary Survey of the δ Region. FRANK ADCOCK (Natl. Physical Lab.) *J. Iron Steel Inst., London,* Advance Copy No. 1, Apr. 1937, 7 pp.; *Iron & Steel Ind.,* Vol. 10, May 5, 1937, pp. 437-438. Original research. Liquidus and solidus lines for Fe-C alloys (up to 1% C) were determined by thermal curves. Alloys were prepared from high-purity Fe obtained from $FeCl_3$, and graphite used for spectrographic purposes, by melting in thoria crucibles in vacuum. C content at extreme limit of δ field was 0.10%, at peritectic point 0.16%, and at extreme limit of δ + liquid field 0.51%. The temperature interval between m.p. of Fe and peritectic horizontal was 45° C., and the interval between the m.p. of Fe and the $\delta - \gamma$ transformation in Fe was 150° C. JLG + CMS (10)

The Ordered State in Solid Solutions (Die geordnete Verteilung in metallischen Mischkristallen) R. BECKER. *Metallwirtschaft,* Vol. 16, June 11, 1937, pp. 573-578. Reviews the theoretical and experimental work on super-lattices by such investigators as Bragg, Williams, Bethe, Peierls, Sykes and Jones. GA (10)

Effect of Reversed Deformation on Recrystallization. PAUL A. BECK (Kaiser-Wilh. Inst. Metallforschung) *Metals Tech.,* Vol. 4, June 1937, T.P. 818, 14 pp. Original research. Al single crystals, recrystallized after being bent and partially restraightened, show that the consumptibility (tendency of the deformed crystals to be consumed by the recrystallized new crystals) is decreased and in certain instances even nullified by restraightening. This decrease was established for all crystal orientations and for all deformation values examined. On the other hand, the number of new crystals formed by recrystallization does not exhibit such a uniform effect. Generally, this number also decreases, but in certain instances it actually increases by restraightening. Some differences between the views formulated by different authors may be reconciled by considering the consumptibility and the number of recrystallized crystals as 2 independent factors of "recrystallizing power." JLG (10)

Morphology of the Inclusions in Siderurgical Products. Parts IV and V. A. M. PORTEVIN & RENÉ CASTRO. *J. Iron Steel Inst., London,* Advance Copy No. 12, Apr. 1937, 22 pp. Original research. In part IV inclusions characteristic of the presence of Ti, Zr, and V are described and illustrated. In part V general considerations on the identification and the definition of non-metallic inclusions are presented. See also *Metals and Alloys,* Vol. 8, May 1937, p. MA 294R/5. JLG (10)

Electric Resistance of Hydrogen-charged Tantalum Wires (Der elektrische Widerstand wasserstoffbeladener Tantaldrähte) A. Sieverts & H. Brüning (Jena Univ.) *Z. physik. Chem.*, Vol. 174 (A), Oct. 1935, pp. 365-369. Original research. The H_2 absorbed and the electric resistivity of a Ta wire were determined at 400°, 500° and 600° C., and at pressures from 18 to 760 mm. Hg. The following results are given for a pressure of 760 mm. Hg.:

Temperature: °C.	400	500	600
H_2 absorbed, mg. H_2/100g. Ta.........	217	110.5	56.5

At 500° and 600° C. the amount of H absorbed is quite accurately proportional to the sq. root of the H_2 pressure, whereas at 400° C. it deviates appreciably from this relationship. The increase of electric resistivity is proportional to the amount of H absorbed, and thus also to the sq. root of the H_2 pressure, at 500° and 600° C., and is approximately so at 400° C. At 400° C. only a few resistivity measurements could be made because upon further absorption of H_2 the wire broke, possibly because of the presence of a new phase. ORS (10)

Test of the Mass-action Law in Concentrated Molten Solutions by Potential Measurements (Die Prüfung des Massenwirkungsgesetzes bei konzentrierten schmelzflüssigen Lösungen durch Potentialmessungen) L. Holub, F. Neubert & F. Sauerwald (Tech. Hochschule, Breslau) *Z. physik. Chem.*, Vol. 174, (A), Oct. 1935, pp. 161-198. Original research. Equilibrium constants and activity ratios of reactions between metals and their molten salts in the systems: $Pb\text{-}Sn\text{-}Cl_2$, $Pb\text{-}Cd\text{-}Cl_2$, $Pb\text{-}Ag\text{-}Cl_2$, $Pb\text{-}Tl\text{-}Cl_2$, $Pb\text{-}Ag\text{-}Br_2$, $Pb\text{-}Ag\text{-}I_2$, $Tl\text{-}Cd\text{-}Cl_2$ and $Cd\text{-}Sn\text{-}Cl_2$ are determined by electrochemical potential measurements, whose technique is described in detail. The majority of the electrochemically determined equilibrium constants do not agree with those computed according to the mass-action law for perfect gases nor with those computed according to the general mass-action law of Lorenz & van Laar. ORS (10)

Metallic Single Crystals and Plastic Deformation. S. L. Hoyt (A. O. Smith Corp.) *Trans. Am. Soc. Metals,* Vol. 24, Dec. 1936, pp. 789-827. Extensive review of single-crystal literature dealing with plastic deformation. The factors of grain boundary conditions, orientation and constraint of movement of the polycrystalline state are differentiated from factors of crystalline slip, twinning and work hardening. GEG (10)

Hardening Reactions of some Annealed Co-W-Fe Alloys (Ueber die Vorgänge bei der Anlasshärtung einiger Co-W-Fe-Legierungen) H. Cornelius, E. Osswald & F. Bollenrath (Deutschen Versuchsanstalt für Luftfahrt) *Metallwirtschaft,* Vol. 16, Apr. 23, 1937, pp. 393-399. Research. In Co the authors found only one transformation: cubic face centered (high temp. phase) to hexagonal lattice, at approx. 400° C. The ϵ phase in the Co-W system established by W. Sykes was confirmed. The aging of 3 alloys (70, 55, 40% Co-, 20, 25, 40% W; 10, 20, 20% Fe), which when quenched exhibited a face-centered cubic lattice, were studied. In the first 2 the changes in hardness are accomplished by different processes at high and low annealing temperatures. The 55% Co, 25% W, 20% Fe alloy when aged at 650° C. increased in hardness by 300% to a maximum of 650 Brinell. The hardening processes were studied microscopically and by X-rays. See also *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 100R/8. GA (10)

Hot Working, Cold Working and Recrystallization Structure. N. P. Goss (Cold Metal Process Co.) *Trans. Am. Soc. Metals,* Vol. 24, Dec. 1936, pp. 967-1020. With discussion. Theoretical discussion of X-ray methods used in the investigation of structural changes of the grains in hot worked, cold worked and heat treated steel. Metallic crystals are subdivided into "blocks." Asterism and diffuse diffraction spots indicate irregularly arranged "blocks." Hardening is explained by changes in block structure. Large and well aligned blocks as in Si steel produce good magnetic properties; Si-free steel has smaller blocks with poorer alignment, hence poorer magnetic properties. GEG (10)

The Solubility of Cadmium in Lead and the Constant Lattice Parameter of the Lead-cadmium Solid Solution (Ueber die Löslichkeit des Cadmiums in Blei im festen Zustande und die dabei festgestellte Unveranderlichkeit des Gitterparameters des Bleis) E. Jenckel & H. Mäder (Kaiser Wilh. Inst.) *Metallwirtschaft,* Vol. 16, May 21, 1937, pp. 499-502. Research. Hardness and electrical measurements showed the solubility of Cd in Pb to decrease from 3.1% at the eutectic temperature to approximately 0.6% at room temperature. Lattice parameter measurements revealed no change in dimensions of the Pb lattice with as much as 2.86% Cd in solid solution. Density measurements indicated that the solid solution is of the substitutional type, the lead lattice apparently taking up the smaller Cd atom without appreciable lattice distortion. GA (10)

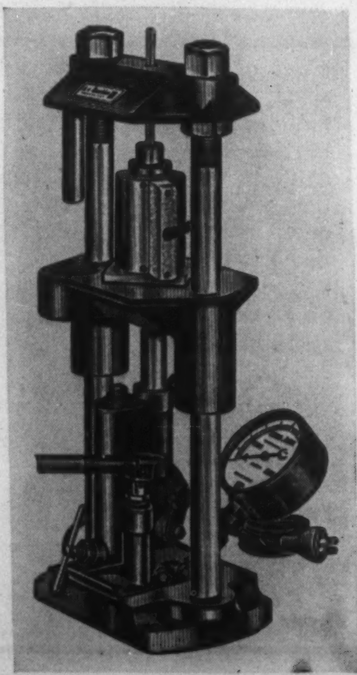
Transparent Mountings for Irregular Specimens

The dream of the Metallurgist became true with the introduction of an absolutely clear and transparent mounting material. See all sides of the specimen. Observe the location of a broken weld and study the very spot microscopically. Ideal for "The Electrolytic Etch."

The New A-B Specimen Press

Hundreds of Metallurgists using our press never again would go back to the old melting pot and ladle method for mounting metal specimens. For "extreme edge" studies, convenience in handling, speed and economy use the A-B Hydraulic Press and eliminate differential etching action frequently encountered with the fusible alloy.

A new service devoted to the Metallurgist.

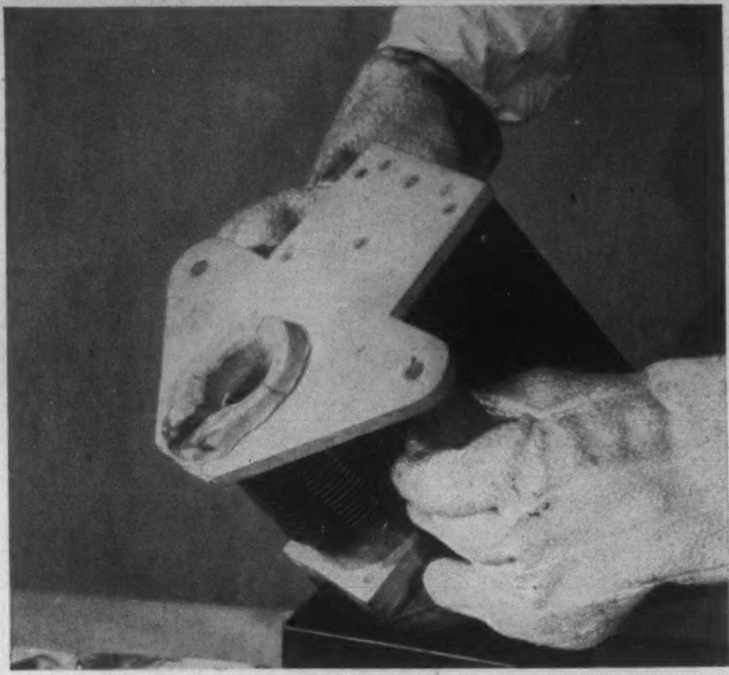


Ask for your copy of "The Metal Analyst" featuring new methods for the daily routine of the Metallurgist.

Adolph I. Buehler
OPTICAL INSTRUMENTS • METALLURGICAL APPARATUS
228 NORTH LA SALLE ST. • • CHICAGO ILL.

LEPEL

High Frequency Induction Furnaces



3 lb. Steel — 15 min. — 6 K.W.
10 oz. Steel — 6 min. — 3 K.W.
20 lb. Copper - 60 min. - 6 K. W.

Write for Bulletins 400 & 409

Lepel High Frequency Labs. Inc.
39 West 60th St. New York City

The Grain Growth of Electrolytic Iron and Some of Its Alloys Melted in Vacuum. M. Hamasumi, T. Takano & K. Otomo. *Kinzoku-no-Kenkyu,* Vol. 14, Mar. 1937, pp. 107-112. In Japanese. Original research. The grain growth of 83% cold-worked sheet of electrolytic Fe, 3.45% Ni-Fe and 2 kinds of transformer sheet, the one containing 3.80% Si and the other containing 0.30% P, was measured by Zimmer's method. Strips were annealed at temperatures of 500° C. to 1200° C. for 30 min. and at 800° C. for various times from ½ to 10 hrs. Below 900° C. the grain size of electrolytic Fe is most coarse and that of the other materials is nearly the same. Hence the low watt loss of Si-Fe is not caused by its special coarse crystalline structure in comparison with the other materials. Over 1000° C. the grain growth of Si-Fe is remarkable; the grain sizes of the materials annealed at 1200° C. for 30 min. are in the following proportions: 3.45% Ni-Fe, 1; 0.30% P-Fe, 1.83; electrolytic Fe, 13.5 and 3.80% Si-Fe, 292. KT (10)

Analytical Expression of Granulation Processes. A. Makaryants. *Metallurg,* Vol. 12, Apr. 1937, pp. 137-141. In Russian. Polemical. Disagrees with views expressed by I. Gaev (see *Metals and Alloys,* Vol. 8, Aug. 1937, p. MA 502R/3). (10)

Anisotropy in the Atomic Vibrations of Zinc Crystals. G. E. M. Jauncey & W. A. Bruce. *Phys. Rev.,* Vol. 50, Sept. 1, 1936, pp. 413-416. Original research. The general radiation from a W tube was used together with Jauncey and Claus' method of integration over all wave-lengths. Because of the high absorption coefficient of Zn it was necessary to scatter the X-ray from the front surface of the Zn crystals. Correction for the presence of fluorescent rays was made. A number of Zn crystals were grown. The control of the direction of the major and minor axes with respect to the surface of the crystal is described. Two types of experiment were made: (1) the variation of S with χ, the orientation angle, for a fixed value of ϕ, the scattering angle; and (2) the variation of S with ϕ for two fixed values of χ, one near 90° and the other near 0°. (1) gave remarkable confirmation of the correctness of the form of Zener's formula for the Debye-Waller M for hexagonal crystals, while (2) confirmed in a general way values as obtained in (1) for a and b in Zener's formula.A much higher anisotropy ($a - b = 1.66$) than that suggested by Brindley, ($a - b = 0.785$) was found. WAT (10)

An X-ray Study of the Chromium-aluminium Equilibrium Diagram. A. J. Bradley & S. S. Lu (Univ. Manchester) *J. Inst. Metals,* Vol. 60, 1937, Advance Copy No. 769, 19 pp. Original research. X-ray powder photographs were made from more than 70 slowly cooled and quenched Cr-Al alloys. These provided a basis for a tentative equilibrium diagram. 9 phases exist after slow cooling from 800° C. to room temperature, and 2 others were found in alloys quenched from 1000 and 1100° C. The α body-centered cubic structure formed by solution of Al in Cr exists from 0 to 30% Al at temperatures above 850° C. Below this temperature alloys containing about 25% Al change to a tetragonal β structure. This is a superlattice made by stacking 3 body-centered cubes above each other. 3 phases with structures resembling that of γ brass were found after slow cooling, and a fourth was found after quenching from 1100° C. These all appear to be distorted forms of the γ-type structure. γ_2 exists around the composition Cr_5Al_8. This phase is derived from a body-centered cubic structure of the γ-type by elongation in the direction of the trigonal axis, so that the symmetry is rhombohedral. It decomposes at about 890° C. γ_3 exists around the composition Cr_4Al_9 at temperatures between 700 and 870° C. Below 700° C. it gradually transforms into the related γ_4 structure. At still lower temperatures, the composition of γ_3 is more limited, whereas that of γ_4 increases, until at room temperature γ_3 is restricted to a very narrow range of compositions. At each temperature below 700° C. γ_3 contains just a little more Cr than γ_4. There are 3 closely related phases Θ, η, and ϵ, with the approximate formulas $CrAl_7$, Cr_2Al_{11}, and $CrAl_4$, and melting points 725, 900 and 1011° C., respectively. A phase with the formula $CrAl_3$ exists in alloys quenched from above 850° C. and melts at 1180° C. JLG (10)

New Ternary Compounds with the Beta Brass Superstructure. (Ueber einige neue ternäre Verbindungen mit einer Uberstruktur des Beta Messings) P. Rahlfs (Mineralogisches Institut, Göttingen) *Metallwirtschaft,* Vol. 16, June 25, 1937, pp. 640-643. Research. From Debye-Scherrer photograms the parameters of 4 new phases that crystallize as body-centered cubic lattices with the formation of superlattices were determined. The lattice data are:

β $(Cu, Ni)_3$ Sn $a' = 2a = 5.746$ A.U.
β $(Cu, Ni)_3$ Sb $a' = 2a = 5.857$ A.U.
Ni_2 Mg Sn $a' = 2a = 6.097$ A.U.
Ni_2 Mg Sb $a' = 2a = 6.050$ A.U.

GA (10)

Hardening Reactions of Some Annealed Co-W-Fe Alloys (Ueber die Vorgänge bei der Anlasshärtung einiger Co-W-Fe-Legierungen) H. Cornelius, E. Osswald & F. Bollenrath (Deutschen Versuchsanstalt für Luftfahrt) *Metallwirtschaft,* Vol. 16, Apr. 23, 1937, pp. 393-399. Research. In Co only one transformation was found, cubic face-centered (high temp. phase) to hexagonal lattice occurring at around 400° C. The η phase in the Co-W system established by Sykes was confirmed. The aging of 3 alloys, (70, 55, 40% Co, 20, 25, 40% W, 10, 20, 20% Fe) which, when quenched, exhibited a face-centered cubic lattice was studied. In the first two, changes in hardness at high and low annealing temperatures are accomplished by different processes. The 55% Co, 25% W, and 20% Fe alloy when aged at 650° C. increased in hardness by 300% to a max. of 650 Brinell. The hardening processes were studied microscopically and with X-rays. GA (10)

The Co-Si Equilibrium Diagram. U. Hashimoto. *Nippon Kinzoku Gakukai-Si,* Vol. 1, July 1937, pp. 135-142. In Japanese. Original research. The Co-Si system was thoroughly investigated by thermal, microscopic, X-ray, dilatometric and magnetic analyses, and a new diagram is proposed. In this system there exist 4 compounds, i.e., Co_2Si (ϵ), CoSi (η), $CoSi_2$ and Co_3Si (γ); the first three melt without decomposition at 1332°, 1460° and 1336° C. respectively, while the last is formed by the following peritectic reaction, at 1212° C.:

$$\text{melt} + \delta \rightleftarrows Co_3Si\ (\gamma)$$

The compound Co_2Si changes to δ phase at 1320° C.; the change is probably allotropic. The compound $CoSi_2$ has a slight thermal change at 1258° C., but it is not an allotropic change. The compounds Co_3Si_2 and $CoSi_3$, proposed by K. Lewkonya, do not exist. The $\alpha \rightleftarrows \beta$ transformation point of Co rises with increasing Si content, and decomposes to β and δ by the peritectoid reaction at 755° C. and 6.5% Si. KT (10)

Metal Nickelhydrides (Ueber metallartige Nickelhydride) W. Bussem & F. Gross. *Metallwirtschaft,* Vol. 16, July 2, 1937, pp. 669-671. Review plus research. Ni evaporated in vacuum or H atmosphere crystallizes as a face-centered cubic lattice, but when it is evaporated in an activated (1500 volt discharge) H atmosphere it crystallizes as a hexagonal Ni hydride similar to that obtained by cathodic sputtering. GA (10)

11 · PROPERTIES

Symposium on New Metals and Alloys Applicable to the Chemical Industry. *Ind. Eng. Chem.*, Vol. 281, Dec. 1936, pp. 1366-1416. **Evolution of New Metals.** B. D. SAKLATWALLA, pp. 1366-1373; discussion, CLYDE E. WILLIAMS, pp. 1373-1374. See *Metals and Alloys*, Vol. 8, May 1937, p. MA 306L/6. **Steels Resistant to Scaling and Corrosion.** FLORENCE FENWICK & JOHN JOHNSTON. Pp. 1374-1379; discussion, T. S. FULLER, p. 1379; discussion of New Ferrous Alloys for the Oil Industry, L. W. VOLLMER & BLAINE B. WESCOTT, pp. 1379-1380. Steels of higher strength can in many applications be used to advantage only if they have a greater resistance to corrosion than ordinary ferrous materials; and enhanced corrosion resistance is usually a primary requirement in metals for use in structures where lightness is desirable. The corrosion resistance of a metal depends upon the extent to which the product of its reaction with the environment isolates the metal from the environment, depending therefore upon both environment and metal. The isolating agent is a film which may in many environments be protective against further attack, as in stainless steels, or moderately impervious, as in some of the newer rust-resistant steels, or relatively pervious and unstable, as in ordinary ferrous materials. The difference is thus in degree rather than in kind, and appears to be associated with differences in the ability of the film to resist breakdown or to heal itself if broken. This view, which is supported by experimental evidence, is used as a basis for the discussion of the range of usefulness of some of the corrosion-resistant steels. The alloys that resist corrosion by sour crude oil in the production, transportation and refining of oil, are considered in the second discussion. **Chromium and Its Alloys.** W. J. PRIESTLEY. Pp. 1381-1385; discussion, V. B. BROWNE, pp. 1385-1386; discussion of Chromium-bearing Steels in Pressure Vessel Construction, R. K. HOPKINS pp. 1386-1387; discussion, E. C. WRIGHT, p. 1387; general discussion, H. L. MAXWELL, p. 1388; discussion of New Metals in the Pulp and Paper Industry, J. D. MILLER, pp. 1389-1390. See *Metals and Alloys*, Vol. 8, April 1937, p. MA 236R/7. **Nickel and Corrosion-resisting Nickel Alloys.** ROBERT J. MCKAY. pp. 1391-1397. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 169R/2. **Wrought Copper Base Alloys.** D. K. CRAMPTON. Pp. 1397-1400; discussion. W. H. BASSETT, JR., pp. 1400-1401; discussion, WILLIAM P. SAUNIER, p. 1401. Cu tubes are being increasingly used for all water supplies, for pulp lines in the paper industry, air lines, oil and vapor lines, etc. Red brass is the preferred material for resisting corrosion from water. Cupronickel containing 20-30% Ni, and up to 5% Zn, is much used for condenser tubes, is highly resistant to all types of attack in fresh and salt waters, is immune to dezincification and corrosion cracking. The Si-bronzes (3% Si mostly) combine in themselves a large number of desirable properties, and are much preferred for welded equipment, for manufacture of springs and bolts, and of Fourdrinier wire in paper making. Some of the newer alloys comprise Al-brass for condenser use and Sn-Al-brass which are immune to dezincification under practically all conditions. Sb in small amounts aids in rendering brasses resistant to dezincification, and is preferred to As. An alloy of great promise is Ni-Al bronze or rather high Ni (7.5—15%) and Al (1.5—3%) content. In the welding field, coated rod for metallic arc-welding and non-fuming brazing rod are important accessories to fabrication of chemical equipment. A recent development is that of composite tubes for withstanding serious corrosion in oil refinery tubes. Further uses of these and other alloys are mentioned in the discussions. **Aluminum and Its Alloys.** WM. L. FINK. Pp. 1402-1406. Al possesses a combination of chemical and physical properties which fit it admirably for service in contact with many chemicals. Higher efficiency, higher quality of product, and lower costs of operating or transportation, are among the advantages to be gained by the intelligent use of Al. The properties of Al and its alloys, and the choice of alloys for particular processing conditions, as well as the care of Al equipment, are discussed. A table is given showing the factors for design stresses at temperatures from 100° to 500° F. **New Metals and Alloys from Lead, Tin, Zinc, and Antimony.** GEORGE O. HIERS. Pp. 1406-1408; discussions, L. H. ALMY, L. S. DEITZ, JR., C. P. LARRABEE; discussion of Materials for Cable Sheath, W. H. BASSETT, JR., pp. 1408-1411. Pb is prominently used in the heavy chemical industry and in other lines. When alloyed with a few hundredths per cent Te, it meets drastic conditions successfully. Improved mechanical properties augment good corrosion resistance, producing a superior material of construction. Pb alloyed with Sb (between 6-28%) is used in appreciable quantities on account of its physical properties. A Pb alloy containing 1% Ag and another with 7% Sn are used as anodes in electroplating. Pure Sn is used with chemicals because of its corrosion resistance and non-toxic nature. Zn-coated metals and die-casting alloys are used despite somewhat limited corrosion resistance. **Silver, Gold, Tantalum, and the Platinum Metals.** JAMES A. LEE. Pp. 1412-1415; discussion, R. H. LEACH, pp. 1415-1416; discussion, C. L. MANTELL, p. 1416. Ag has been used to a limited extent for chemical equipment for many years, but recent economic changes have broadened its use in the industry. Ag equipment is generally made entirely of the one metal. Fine Ag is preferred; sterling and coin Ag are not so resistant although their strength is greater. The initial cost of Ag equipment is high because of the large quantity of metal involved, but much of it may be salvaged when the equipment is scrapped. Pt, Au, Pd, and Ta are utilized for construction but in relatively small quantities and only in vital spots for extreme conditions. Some specific uses of these metals and the most outstanding properties are cited. MEH (11)

Change of Magnetic Susceptibility in Metals during Melting and Allotropic Transformation. Y. SHIMIZU. *Nippon Kinzoku Gakukai-Si*, Vol. 1, July 1937, pp. 113-119. In Japanese. Original research. An accurate measurement of the abrupt change of magnetic susceptibility in metals during melting and allotropic transformation was made. An attempt is also made to explain quantitatively these abrupt changes of susceptibility by applying the theory, which was proposed in the explanation of the change of susceptibility in metals caused by cold working. Sn changes the sign of its magnetic susceptibility twice as the temperature rises, that is, at the transformation point and also at the melting point. These phenomena are satisfactorily explained by the theory. A good agreement has also been found between the observed change of susceptibility during melting in the case of Cu, Ag, Au, Al, Hg, Na, K, Rb and Cs. KT (11)

On the Thermal Conductivity of Pure Iron. D. HATTORI. *Nippon Kanzoku Gakukai-Si*, Vol. 1, July 1937, pp. 120-126. In Japanese. Original research. Considerable variation exists in values for the thermal conductivity of pure Fe found in the literature, and the selection of the most nearly correct one is very difficult. A new apparatus suitable for measuring the thermal conductivity of Fe and steel was devised, and the conductivity of Armco Fe at various temperatures between 30° and 700° C. was determined. The most probable value for the conductivity of pure Fe at about 30° was 0.174 with a range of 0.172 to 0.175 cal. per ° C. cm. sec. The conductivity at temperatures between 50° and 700° C. is also given. KT (11)

The Influence of Gas Atmosphere during Annealing on the Microstructure and Bend Test of Nickel Sheet (Ueber den Einfluss der Gasatmosphäre beim Glühen auf Randgefüge und Biegezahl von Nickelblech) H. WINTERHAGER (Techn. Hochschule, Aachen) *Metallwirtschaft*, Vol. 16, July 2, 1937, pp. 671-673. Research. The effect of annealing Ni sheet in CO, O_2, H_2, and Cl_2 atmospheres was investigated with regards to time and temperature of anneal. Small strips of Ni sheet were examined microscopically and bend tests made after being exposed to a given atmosphere. CO forms a thin surface layer and decreases the bend test properties only slightly. H_2 has no noticeable effect. O_2 is harmful in long high temperature anneals. Cl destroys the coherence of the grains. H_2 reduction of an oxidized Ni specimen led to the formation of many cracks. GA (11)

The Nature of the Electron Carriers in Supraconduction (Sur la Catégorie des Electrons Porteurs de la Supraconduction) ROBERT FORRER (Inst. Phys., Strasbourg) *J. Phys. Rad.*, Vol. 8, Feb. 1937, pp. 67-80. Theoretical analysis. A general law by which the possession or non-possession of supraconductivity may be predicted from a knowledge of the electronic structure of a material is postulated. FPP (11)

11a. Non-Ferrous

A. J. PHILLIPS, SECTION EDITOR

Copper-rich Nickel-aluminium-copper Alloys. Part I.—The Effect of Heat-treatment on Hardness and Electrical Resistivity. W. O. ALEXANDER & D. HANSON (Univ. Birmingham) *J. Inst. Metals,* Vol. 61, 1937, Advance Copy No. 774, 17 pp. Original research. Fifty-six Cu alloys containing up to 10% each of Ni and Al were cast and extruded. They were quenched from 900° C. after holding at this temperature for 18 hrs. Samples were then heated to temperatures between 400 and 800° C. and either quenched in water or furnace cooled. Diamond-pyramid hardness and electric resistance were determined. Results indicated that above 800° C. all alloys consist of uniform α solution. When heated below 800° C. some of the alloys harden and their electric resistance decreases. The results reveal the approximate limits of the α solid solution, while the manner of the changes in properties at lower temperatures implies precipitation of new phases. JLG (11a)

Magnetic Alloys. K. HONDA. *Nippon Kinzoku Gakukai-Si,* Vol. 1, May 1937, pp. 3-7. In Japanese. Review. High permeability alloys such as permalloy, superpermalloy No. 1 (70-80% Ni, 15-30% Fe, 0-4% Co, 0-1% Mn, 0-2% Si), No. 2 (40-90% Ni, 10-60% Fe, 0-5%Cr, 0-5% Sn), No. 3 (84.5-95% Ni, 5-20% Fe, 1-6% Cr, 0.1-2% Ti) and Sendust (6-11% Si, 4-8% Al, balance Fe) are described. The latter four were developed by the author. Superpermalloy Nos. 2 and 3 need no quenching. Alloys of constant permeability such as perminvar, isoperm and superperminvar are described. The last, also invented by the author, contains 50-90% Fe, 1-20% Ni and 5-40% Co, and has constant permeability up to 7.4 Oersted, or 12 times that of pure Fe. Other permanent magnet alloys, belonging to the dispersed system, are described. The dispersed system consists of minute particles of a separate phase which are magnetized with difficulty, but once magnetized not easily demagnetized. Finely divided Fe made from Fe oxalate and stamped in H atmosphere has a coercive force as high as 150 Oested. KT (11a)

The Influence of Small Additions of Iron, Cobalt, and Nickel on the Stability of Zinc in Sulphuric Acid (Der Einfluss kleiner Zusätze von Eisen, Kobalt, Nickel u.a. auf Schwefelsäurebeständigkeit von Zink) H. WINTER (Metallgesellschaft A.G.) *Metallwirtschaft,* Vol. 16, May 28, 1937, pp. 521-522. Research. Cd and Pb increase the stability of Zn in sulphuric acid solution, while a few thousands of a per cent of Fe, Co, Ni, Sn, or Ge decreases the stability considerably. Temperature measurements, taken at a definite interval after immersing a standard Zn specimen in sulphuric acid, were taken as a measure of the relative stability of the Zn. GA (11a)

A New Alloy "Sendust" and its Magnetic and Electrical Properties. H. MASUMOTO & T. YAMAMOTO. *Nippon Kinzoku Gakukai-Si,* July 1937, pp. 127-134. In Japanese. Descriptive. The magnetic and electrical properties of the binary and ternary alloys involving Fe, Si and Al were measured, and the relations of these properties to the respective compositions investigated. Those alloys containing 6-11% Si, 4-8% Al show excellent magnetic properties; a representative alloy contains 9.62% Si and 5.38% Al. Some of its physical constants are: Initial permeability, 35,100; maximum permeability, 117,500; magnetic hysteresis-loss, 28 ergs/cc. per cycle; coercive force, 0.022 oersteds; and specific electric resistance, 81 microhms/cc. at 20° C. KT (11a)

Bronze with 2.7% Ni as a Bearing Metal. N. SERAFIMOV. *Metallurg,* Vol. 12, Apr. 1937, pp. 131-133. In Russian. A bronze containing 85-86% Cu, 11-12% Sn, 0.1-0.2% P and 2-2.7% Ni has exceptionally bad bearing properties when run in contact with steel. Cold working its surface under a load of 15,500-17,000 lbs./in.^{2} resulted in excellent bearing characteristics and the bronze was able to stand 14,200 lbs./in.^{2} load at 0.8 m./sec. without any harm. (11a)

The Frictional Properties of Light Metal Bearings with Special Consideration of Quarzal (Ueber die Gleiteigenschaften von Leichtmetall- Lagermetallen mit besonderer Berücksichtigung von Quarzal) M. v. SCHWARZ. *Metallwirtschaft,* Vol. 16, July 30, 1937, pp. 771-776. Practical. Data and discussion of the bearing properties of a series of Al-Cu alloys. With good lubrication of the Al alloy bearing exhibit good frictional properties and long life. They surpass in life the babbits and some bronzes and in addition have a lower coefficient of friction. Brief mention is made of Mg base alloys which can be used for lightly stressed bearings running at low temperatures. GA (11a)

Effect of Temperature on the Tensile Properties of Aluminum and Its Alloys in the Completely Stabilized State (Temperaturabhangigkeit der Festigkeitseigenschaften von Aluminium und Aluminiumlegierungen im vollständig stabilisierten Zustand) A. VON ZEERLEDER & EMIL V. BURG (Aluminium Industrie) *Z. Metallkunde,* Vol. 29, Apr. 1937, p. 132. Research. The tensile properties of pure Al and of 7 commonly used alloys are plotted from 0° to 450° C. The specimens were homogenized for 4 hrs., the temperature depending upon their composition, and cooled to the test temperature at the rate of 50° per 24 hrs. GD (11a)

Copper-tin-magnesium Alloys Rich in Copper (Leghe ramestagno-magnesio ricche in rame) G. VENTURELLO & M. FORNASERI (Turin Polytech. Inst.) *Met. Ital.,* Vol. 29, May 1937, pp. 213-221. Original research. The diagram of the Cu-Sn-Mg system was determined for the high-Cu region, with up to 12% each of Sn and Mg. The diagrams are in agreement with results of other investigators. The effect of annealing, hardening and tempering at 300° and 450° C. on the Brinell hardness (using 10 mm. sphere and 500 kg. load) of a number of samples was determined. The softest alloy, containing 98% Cu, 1.2% Sn, and 0.8% Mg shows hardness as follows: annealed, 52; hardened, 54; tempered at 300° C., 64; hardened at 450° C., 55. The hardest alloy contained 90.2% Cu, 1.85% Sn and 7.95% Mg, with a hardness of 150 after annealing, 149 hardened, and 160 and 180 respectively when tempered at 300° or 450° C. 28 references. AWC (11a)

On the Effect of Stretching and Twisting on the Discontinuous Process of Magnetization in Nickel, Iron and Nickel-iron Alloys. JUNZO OKUBO & MITIYASU TAKAGI. *Science Repts. Tohoku Imp. Univ.,* Vol. 25, Nov. 1936, pp. 426-479. In English. Review plus research. Mathematical physics. BWG (11a)

11b. Ferrous

V. V. KENDALL, SECTION EDITOR

Influence of Quenching in Hot Media and of Repeated Drawing on Hardness and Strength of High Speed Steels at Elevated Temperatures. S. STEINBERG. *Kach. Stal,* Vol. 5, No. 3, 1937, pp. 22-25. In Russian. Original research. Steels containing 0.70% C, 17.3 W, 4.13 Cr, 0.5 V and 0.80% C, 18.41 W, 4.65 Cr, 0.56 V were studied. After machining into 12 x 15 mm. cylinders they were quenched from 1280° C. in a Pb bath at 560°, 580°, 600°, 620° C., held there for time intervals proportional to temperature and requenched in oil. A comparison set was quenched in oil at 20° C. and drawn at 560°-580° C. as usual. The optimum heating time depends on the temperature and varied from 4 hrs. at 560° C. to 20 min. at 620° C., being independent of the quenching temperature. Quenching in Pb baths at proper temperatures pronouncedly increases the life of tools as compared with tools quenched in oil and drawn. Replacing a single draw at a given temperature with several shorter draws, equal total time, remarkably improved cutting properties. (11b)

Utilization of Tungsten-free Substitutes of High Speed Steel for Making Cutting Tools. V. VLADISLAVLEV & A. IVANOV. *Kach. Stal,* Vol. 5, No. 4, 1937, pp. 7-11. In Russian. Original research. Steels containing 0.65-0.80% C, 1.5-2.0 Si, 9-10.5 Cr, 0.85-1.2 V, 0.40 Mn max., and 1.0-1.15% C, 1.1-1.7 Si, 11-13 Cr, 2.1-2.5 V, 0.40 Mn max. are recommended. They are rolled starting at 1100-1150° C. and finishing at 850-900° C.; annealed at 840-860° C. using the same heating and cooling rates as for high speed steel. Quenching range of these steels is much narrower than that of the usual high speed steels so that a careful treatment is absolutely necessary. Best hardness for finishing tools is within 55-58 Rockwell C, and is obtained by soaking 2-3 min. at 1150-1225° C. after the usual preheating, quenching in oil and drawing at 540° C. Drawing for one hr. and cooling in air, repeated several times, is preferable to a single drawing for a longer time at the same temperature. (11b)

Magnetically Hard, Low Carbon Nickel-copper Steels (Magnetischharte, C-arme Nickel- Kupfer- Stähle) H. LEGAT. *Metallwirtschaft,* Vol. 16, July 23, 1937, pp. 743-749. Research. The boundaries of the single phase regions in the Fe-Cu system were determined at 400° C. and 1250° C. for the Fe corner of the ternary system Fe-Cu-Ni. Steels containing up to 25% Cu and 25% Ni were aged and residual induction and coercive force determined. An alloy containing 15% Cu and 15% Ni gave the highest coercive force—300 oersteds. The residual induction for this alloy was 1500 gauss. Additions of varying amounts of C, Si, Mn, Co, Mo, W, V, Ti, Ta, Zn, Ag, Sb, Bi, and Cr individually to the Cu-Ni-Fe alloys failed to improve the magnetic properties materially. GA (11b)

Mechanical Properties of Rope Wire in the Temperature Range of +20° to —50° C. (Mechanische Eigenschaften von Seildraht im Temperaturgebiet von +20 bis —50°) A. POMP & A. KRISCH. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch., Düsseldorf,* Vol. 19, No. 7, 1937, pp. 97-103. Original research. Tensile strength, elongation, reduction of area, bending and torsion resistance were investigated for 3 annealed and 12 drawn wires in the range of +20° to —50° C. Tensile strength increased in all wires with lower temperatures while elongation and reduction of area remained almost constant. In some of the wires bending and torsional strength decreased, with minimum values at —20° C. 7 references. Ha (11b)

The Effect of Phosphorus on the Mechanical and Corrosion-resisting Properties of Low-carbon and of Low-alloy Structural Steels. J. A. JONES (United Steel Companies) *J. Iron Steel Inst., London,* Advance Copy No. 9, Apr. 1937, 26 pp; *Iron & Steel Ind.,* Vol. 10, May 5, 1937, pp. 432-437. **Effect of Phosphorus in Structural Steels.** Ibid., *Iron Age,* Vol. 140, July 1, 1937, p. 33. Original research. Relative properties of C and low-alloy structural steels of low and high P content are reviewed. Induction-furnace heats, weighing 18 lbs., of steels containing various amounts of C, Mn, P, Si, Cu, Mo were made and tested. Results indicated that for high-P steels C must be kept low to insure desired mechanical properties. For structural purposes, calling for maximum tensile strength, high-P steels are not suitable owing to low impact resistance. A steel of normal P content is to be preferred, as this is free from the necessity of restricting C content and enables a tensile strength of 37 tons./in.^{2} to be obtained without the disadvantages accompanying the use of high P. Laboratory tests showed no increased corrosion resistance due to high P. [The tests used, 28 days duration, are worthless for indicating resistance to long-time atmospheric corrosion.—J.L.G.] JLG + CEJ + VSP (11b)

Phase Diagram and Electrical Conductivity of Rb-Cs Alloys (Diagramme de Solidification et Conductivité Électrique des Alliages Rubidium-Caesium) ÉMILE RINCK. *Compt. Rend.,* Vol. 105, July 12, 1937, pp. 135-137. Original research, continued from work reported in *Compt. Rend.,* 203, 1936, p. 255. After purification by double distillation in vacuo, the melting point of Cs was 28.4° C. and that of Rb was 38.85° C. The phase diagram consists of a continuous series of solid solutions with a minimum at 9° C. Includes curves showing the variation in electrical conductivity at different temperatures for a complete range of compositions. FHC (11b)

Hydrogen Permeability and Decarburization of Cast Iron (Wasserstoffdurchlassigkeit und-Entkohlung von Gusseisen) W. BAUKLOH & F. SPRINGORUM (Techn. Hochschule, Berlin) *Metallwirtschaft,* Vol. 16, May 7, 1937, pp. 446-449. Research. The H permeability of cast Fe is a function of the amount and manner of distribution of graphite present. Except for white cast Fe the diffusion of H through the graphite-containing voids rather than the metal lattice is the controlling factor as is shown by the fact that there is no apparent break in the permeability-temperaure curve corresponding to α-γ transformation. Decarburization of cast Fe by H increases with increasing H permeability. GA (11b)

Properties of Alloys of Fe-Ru and Fe-Os (Propriétés des Alliages du Fer avec le Ruthenium et l'Osmium) MAURICE FALLOT. *Compt. Rend.,* Vol. 205, July 19, 1937, pp. 227-230. Original research. Charts show the variation in magnetic properties in the α ferromagnetic range for these two binary alloys, which comprises 0 to 14% Ru and 0 to 11% Os. FHC (11b)

Definition of Nuance in Steel (Sur la Définition de la Nuance des Aciers) GEORGES CHARPY. *Compt. Rend.,* Vol. 204, June 14, 1937, pp. 1774-1776. General discussion. Defines nuances in steel as meaning the slight variation in tensile strength of different lots of steel, which are supposed to be identical but which in reality have been subjected to slightly different conditions during manufacture. FHC (11b)

New Ferrous Alloys Obtained by Use of Boride Crystals. MILES C. SMITH. *Steel,* Vol. 100, Mar. 29, 1937, pp. 46-47. Descriptive. Alloy Fe and steel with valuable properties can be produced by adding metallic boride crystals to common cast-Fe or low-C steel. Alloy containing 25% crystals and 75% Ni may also be used for alloying. Alloys produced are hard and fine-grained and offer high resistance to abrasion and corrosion. They may be cast into shape but not rolled, forged, or drawn. Steel with 10% crystals has hardness of 63-65 Rockwell C as cast. It may be annealed to machinable softness and then rehardened to any desired hardness up to the original. Temperature reached rather than method of cooling determines degree of hardness. Tabulates properties. MS (11b)

"USING
CHACE
Thermostatic BIMETAL
in the D
SQUARE D
Double-Break"
CIRCUIT BREAKER
SQUARE D COMPANY
DETROIT, MICHIGAN
CHACE
THERMOSTATIC
BIMETAL
"It Bends with the Heat"

Chace Thermostatic Bimetal is the active element employed in the new Square D double-break circuit breaker, which automatically breaks the circuit should an "overload" or "short" occur. Where temperature is a factor and positive, unfailing automatic movement is required, use Chace Thermostatic Bimetal. Offered in various types, each to meet specific demands.

W. M. CHACE CO.
1615 Beard Avenue - - - Detroit Mich.

OFHC
REG. U.S. PAT. OFF.

OXYGEN-FREE HIGH CONDUCTIVITY

A Superior Copper for All Purposes

OFHC Copper conforms to the A.S.T.M. Specification for electrolytic copper wirebars, cakes, etc., B5-27 with regard to metal content and resistivity, and is free from cuprous oxide.

OFHC Copper is characterized by its freedom from casting defects and its bar-for-bar uniformity. Its freedom from oxygen results in great ductility and toughness as evidenced by its high reduction of area and resistance to impact.

OFHC Copper withstands more working in hard condition when tensile strength is greatest, making it especially suited for products subjected to severe fabricating or service conditions.

Copies of a schedule of weights and dimensions of **OFHC** wirebars, cakes and billets, and a booklet containing technical information will be gladly furnished upon request.

UNITED STATES METALS REFINING CO.
420 Lexington Avenue New York, N. Y.

Subsidiary of The American Metal Co. Ltd.
61 Broadway, New York, N. Y.

Effects of Hydrogen on Steel (Wirkungen des Wasserstoffs auf Stahl) P. BARDENHEUER. *Stahl u. Eisen*, Vol. 57, May 27, 1937, pp. 593-601; *Metal Treatment*, Vol. 3, Summer 1937, pp. 60-63, 59. See *Metals and Alloys*, Vol. 8, Sept. 1937, p. MA 542R/1. SE + JCC (11b)

Making Telegraph Wire of Armco Iron. P. ALEKSANDROV & S. USSOV. *Metallurg*, Vol. 12, Apr. 1937, pp. 91-103. In Russian. Detailed description of practice used and properties of wire produced. (11b)

Physical Properties of Axle Shafts. H. B. KNOWLTON (Intern. Harvester Co.) *Trans. Am. Soc. Metals*, Vol. 25, Mar. 1937, pp. 260-291. With discussion. Original research. For the determination of the best type of steel and the best combination of physical properties the following tests were employed: Static tension, static torsion tensile impact, notched bar impact, repeated impact, rotating beam fatigue, torsion fatigue, torsion impact on small specimens and torsion impact on production axles. The selection of the steel and the physical properties depends upon the design of the part and the type of service required. The highest hardness is associated with the greatest working strength, provided stresses are uniformly distributed. 9 references. GEG (11b)

Chrome-molybdenum Carburizing Steel Cuts Production Costs. *Steel*, Vol. 101, July 12, 1937, pp. 70-71. Cr-Mo carburizing steel, tentatively designated S.A.E. 4120, has been developed to provide a low-cost steel for those applications, such as hypoid gears, where core properties of the expensive carburized steels are not essential. When made to controlled grain size, characteristics include quenchability directly from box with a minimum uniform distortion; hard, wear-resisting case; good core properties; and excellent machinability. Ultimate strength ranges up to 166,000 lbs./in.^{2} with yield-points up to 145,000 lbs./in.^{2} MS (11b)

Influence of Beryllium on Technologic Properties of High Speed Steel. S. KAZEEV, A. KHAZAN & P. LUDKOVSKAYA. *Metallurg*, Vol. 12, Jan. 1937, pp. 79-88. In Russian. Original research. To induction furnace heats of the usual 18-4 analysis, Be was added either alone or in combination with 1% V. Be noticeably increases grain-coarsening as cast, makes steel unforgeable when present in amounts greater than 0.65%, reduces hot working properties in the range 0.35-0.65% Be and does not affect forgeability under 0.39% Be. It raises A_{c1-3} point and increases stability of solid solution after quenching much more than V; 0.21% Be is equivalent to 1.0% V. Steels drawn after quenching above 450° C. always have a greater hardness than similarly treated steels not containing Be. V does not affect the character of hardness curves of Be containing steel when it is added to it. When Be and V are added simultaneously they counterbalance improvements of properties which are produced by their being present singly, with the exception of cutting characteristics which are improved in 1% V steel by addition of 0.2-0.3% Be. (11b)

Damping Capacity and its Variation and Relation to other Physical Properties. G. R. BROPHY & E. R. PARKER (Gen. Elec. Res. Lab.) *Trans. Am. Soc. Metals*, Vol. 24, Dec. 1936, pp. 919-930. Review. The various factors influencing damping capacity and the relation of damping capacity to endurance properties and creep resistance of steels are discussed. GEG (11b)

Temper Brittleness of Steels (Sur les Fragilités de Revenu des Aciers) LÉON GUILLET & MARCEL BALLAY. *Compt. Rend.*, Vol. 204, June 21, 1937, pp. 1849-1852. General discussion with some experimental work. Authors describe experiments showing the low impact values for steels which occur when they are heated to 100° and 350° C. Prolonged heating in the interval from 400°-575° C. which gives rise to the classical term "temper brittleness" is also discussed. FHC (11b)

From Lodestone to the Magnetic Alloys (Vom Magneteisenstein bis zu dem Magnetlegierungen) C. W. A. PASEWALDT. *Automobiltech. Z.*, Vol. 40, Apr. 10, 1937, pp. 170-177. A history of the magnetic force and its knowledge is given and the uses to which lodestone was put described. Measurement of magnetic forces, is explained and the modern magnetic alloys to produce strong permanent magnets are discussed. The most recent magnetic alloys contain no C, but consist of Al-Ni, or Al-Ni-Co, or Ni-Co-Ti. Their magnetism is induced by precipitation hardening; the alloys are heated to high temperatures, rapidly quenched, and subsequently tempered at 400°-700° C. whereby γ crystals are precipitated from the α crystals. Another group of modern permanent magnet steels is Fe-Vi-Al; the best type contains 25% Ni and 12% Al with small additions of Co, Cr or W. On the other hand, "soft" magnetic materials have been developed (mu metal, megaperm) of Ni-Fe for permeabilities up to 100,000. Ha (11b)

Copper Has Beneficial Effect on Cast Iron Properties. V. H. SCHNEE (Battelle Mem. Inst.) *Foundry*, Vol. 65, May 1937, pp. 39-40, 127-128. Includes references. Various beneficial effects on cast Fe may be procured by use of Cu, such as: increased fluidity, improvement in casting qualities, hardening of the matrix, tightening of grain structure and purification of the graphite. Considers also the increased use of Cu alloy cast Fe especially in the automobile industry. Includes tables giving the chemical and mechanical properties of various Cu alloy irons. VSP (11b)

Cast Camshafts and Crankshafts Possess Many Advantages. FRED J. WALLS (Intern. Nickel Co.) *Foundry*, Vol. 65, Mar. 1937, pp. 28-30; 83-84; Apr. 1937, pp. 60-61, 163. Factors that justify the use of cast instead of forged camshafts and crankshafts are economy, engineering design and material characteristics. Gives details on fatigue properties and damping capacity. Describes several methods which might be used in making cams; 2 of the most successful treatments are differential hardening and controlled chill. Considers briefly cast alloy steel crankshaft developed by the Ford Motor Co. Includes a number of charts and tables. VSP (11b)

Modified Chromium Steel. *Power Plant Eng.*, Vol. 41, Apr. 1937, p. 242. Cr steels modified by the addition of Cb, Ti, and N show improved properties. Cb eliminates the necessity of annealing to prevent intergranular corrosion. ECK (11b)

Metallurgical Aspects of Hot and Cold Strip for Deep-drawing Requirements. J. E. ANGLE & W. F. MCGARRITY (Carnegie-Illinois Steel Corp.) *Trans. Am. Soc. Mech. Engrs.*, Vol. 59, July 1937, pp. 433-437. Recrystallization in hot-rolling, effects of finishing temperatures on the grain structure and the properties of hot strip, effects of hot and cold coiling, are discussed, with particular regard to their influence on deep-drawing qualities and to requirements in the manufacturing process. 12 references. Ha (11b)

The Selection and Future Requirements of Crankshaft Steel for Aircraft Engines. KOJI TAKASE (Army Aeronautical Res. Inst.) *Tetsu-to-Hagane*, Vol. 23, May 25, 1937, pp. 419-429. In Japanese. Original research. Continuation of previous work (*Tetsu-to-Hagane*, Vol. 19, No. 4 and Vol. 20, No. 9). Endurance strength obtained by notched bar fatigue tests is directly proportional to hardness of steels, but the endurance strength of hardened steels very suddenly decreases if local stresses are induced, the consequence of which is proved by the occurrence of cracks. Therefore, a machine part made of hardened (brittle) steels requires specially fine surface finishing. Ni-Cr and Ni-Cr-W steels show low notch-effect and have similar values when tempered at 500° C. and 600° C., and in view of endurance properties, the tempering of crankshaft steels is recommended at 500° C. rather than 600° C. NS (11b)

Progress in Stainless and Heat Resisting Steels. ERIC N. SIMONS. *Can. Chem. Met.*, Vol. 21, July 1937, pp. 258-259. Brief summary of advances made during the past year. WHB (11b)

Influence of Various Factors on the Formation of Graphite in the Solidification of Cast Iron. A. PORTEVIN & R. LEMOINE. *Iron & Steel Ind.*, Vol. 10, Feb. 1937, pp. 271-272. See *Metals and Alloys*, Vol. 7, Oct. 1936, p. MA 504R/9. CEJ (11b)

First Report of the Alloy Steels Research Committee, Discussion, Correspondence and Committee's Reply. *Iron Steel Inst.*, Special Report No. 14A, 1937, 25 pp. Discussion. Contains discussions and replys to Report No. 14, (see *Metals and Alloys*, Vol. 8, June 1937, p. MA 375R/3), published in 1936. JLG (11b)

Chromium-manganese-copper Steels. YA. GINZBURG. *Kach. Stal*, Vol. 5, No. 1, 1937, pp. 32-35. In Russian. Twelve heats containing 0.15-0.30% C, 0.18-0.32 Si, 0.39-1.15 Mn, 0-0.90 Cr, 0.34-0.91 Cu, 0.011-0.025 P are described. Both manufacturing practice used and mechanical properties produced are covered in detail. Best results were obtained with a heat with 0.17% C, 0.24 Si, 0.82 Mn, 0.014 S, 0.025 P, 0.45 Cr, 0.16 Ni, 0.55 Cu producing (in hot rolled plates) 50,000 lbs./in.^{2} yield point, 80,000 lbs./in.^{2} tensile strength, 20% elongation and 7.1-9.8 kg./m./cm.^{2} impact strength. (11b)

Chromium-tungsten-vanadium Steel with 8% W. for High Efficiency Hot Working Dies. V. ERAKHTIN. *Kach. Stal*, Vol. 5, No. 2, 1937, pp. 40-44. In Russian. Detailed description of properties produced by heat treatment in 0.3% C, 0.35% Si, 0.25% Mn, 2.3% Cr, 8.0% W, (V not determined) steel. (11b)

12 · EFFECT OF TEMPERATURE

The abstracts in this section are prepared in co-operation with the Joint High Temperature Committee of the A.S.M.E. and the A.S.T.M. The purpose of this cooperation is to make readily available complete references to the literature of this subject. The Committee does not necessarily subscribe to the statements of either the author or the abstractor.

H. C. CROSS, SECTION EDITOR

Some Aspects of the Behavior of C and Mo Steels at High Temperatures. C. H. M. Jenkins, H. J. Tapsell, G. A. Mellor & A, C. Johnson. *Trans. Chem. Eng. Congr.*, (World Power Conf., London, 1936), Vol. 1, pp. 122-162. 13 C steels were tested at 450° C. under a load of 8 tons/sq.in. In the wrought condition, a 0.4% C steel has lower strength at 450° C. than a 0.15% C steel; this is the reverse of their relative strengths at room temperature. Steels containing 0.16, 0.19 and 0.40% C showed abnormally low creep resistance (cause not clearly explained). Spheroidization of the cementite lowers creep resistance, while coarsening of the ferrite grains increases creep resistance, most noticeably in the 0.40% C steel. Steels of similar C contents as above with the addition of 0.50 and 1.0% Mo were also examined. They were markedly affected by heat treatment. A steel containing 0.11% C and 0.50% Mo, oil-hardened and tempered, is most resistant to creep. A coarsened structure is more resistant than a normalized structure, while spheroidizing greatly reduces creep resistance. For example, a 0.11% C and 0.52% Mo steel, as spheroidized, is approximately 80 times less creep resistant than that of a similar oil-quenched steel. No difference in resistance to corrosion by flue gas, containing 0.04-0.07% SO_2, was noted. Corrosive attack by superheated steam was likewise the same for all steels. Numerous photomicrographs, graphical creep data, and heat treatment effects on given analyses are included. [Recent unpublished work shows that the austenitic grain size is an important factor in creep resistance. Limited evidence indicates steels with similar composition, heat treatment and grain size may show different creep resistance while differing only in their grain-coarsening characteristics.—H. C. C.] AAA (12)

Steels for High Pressure Steam and High Temperatures. L. Liberman. *Kach. Stal,* Vol. 5, No. 3, 1937, pp. 29-35. In Russian. Steels containing 0.20% C, 0.5% Mo, and 1-2% Cr with or without 1% Ni were investigated in detail. Numerous curves and data presented indicate that the best steel for use between 20° and 600° C. contained 0.13-0.18% C, 1.0-1.2% Mn, 0.7-1.1% Cr, 0.4-0.6% Mo. It had the least susceptibility to aging and the best oxidation resistance both in steam and in air. The mechanical properties of the steel are at least equal to those of 2% Cr, 1.0% Ni, 0.5% Mo or 1.2% Cr, 1.2% Si, 0.5% Mo steel. (12)

Mechanical Properties of Aluminium and Its Alloys after Prolonged Heating. A. von Zeerleder & R. Irmann (Aluminum-Industrie A.G.) *J. Inst. Metals,* Vol. 59, No. 2, 1936, pp. 111-127. With discussion. See *Metals and Alloys,* Vol. 8, Jan. 1937, p. MA 41L/9. (12)

Tensile Fatigue Strength at High Temperature. M. Hempel & H.-E. Tillmanns. *Metal Treatment,* Vol. 3, Summer 1937, pp. 89-84. See *Metals and Alloys,* Vol. 8, Sept. 1937, p. MA 574L/2. JCC (12)

How to Produce Cast Iron that Will Stand High Temperatures (Comment obtenir des fontes Résistant aux Temperatures Élevées) A. Dawans. *Rev. Universelle Mines,* Vol. 13, July 1937, pp. 281-291. Practical review. Graphitization and the expansion associated with transformation cause deterioration of cast Fe at elevated temperatures. This is illustrated by micrographs and constitutional diagrams, and the regions comprising heat-resistant irons are indicated. Additions of Si and Cr are frequently helpful. The main problem is to produce a material with suitable ratio of expansion coefficient to elastic limit. 7 references. Ha (12)

Creep and Engineering Design. R. W. Bailey. *Iron & Steel Ind.,* Vol. 10, May 1937, pp. 389-390. See *Metals and Alloys,* Vol. 8, Sept. 1937, p. MA 575 R/9. CMS (12)

Creep as Occurring in Different Steels under Service Conditions. W. H. Hatfield. *Iron & Steel Ind.,* Vol. 10, May 1937, pp. 388-389. See *Metals and Alloys,* Vol. 8, Sept. 1937, p. MA 575L/6. CEJ (12)

Ferromagnetic Anisotropy in Nickel-cobalt-iron Crystals at Various Temperatures. L. W. McKeehan (Yale Univ.) *Phys. Rev.,* Vol. 51, Jan. 15, 1937, pp. 136-139. Original research. Single crystals of ternary alloys of Ni, Co and Fe with 40% Ni or more have been examined, with a pendulum magnetometer, for ferromagnetic anisotropy. All alloys in this region have face-centered cubic structures, like that of Ni. A region of low anisotropy, for nearly equal Co and Fe contents, appears to be connected with the points where binary alloys of Ni and Co on one side and of Ni and Fe of the other side change their anisotropy types. Measurements were made in all cases at room temperatures, 200° and 400° C. At the higher temperatures anisotropy of either type generally diminishes and, in the region of low anisotropy, the principal anisotropy constant may change sign. Previously reported data for the binary alloys and single components in this system are recomputed and presented to show much better the boundaries of the ternary field. WAT (12)

Relaxation Phenomena in Superconductivity. W. H. Keesom & P. H. van Laer (Kamerling Onnes Lab., Leiden) *Proc. Koninkl. Akad. Wetenschappen Amsterdam,* Vol. 40, No. 5, 1937, pp. 390-391. In English. Original research. In the penetration of the magnetic field, a retardation of the order of tens of minutes was observed. The results are compared with those of other investigators. Several relaxation and hysteresis phenomena of a different kind are to be distinguished. EF (12)

Measurements of the Latent Heat of Tin in Passing from the Supraconductive to the Non-supraconductive State. W. H. Keesom & P. H. van Laer (Kamerling Onnes Lab., Leiden) *Proc. Koninkl. Akad. Wetenschappen Amsterdam,* Vol. 39, No. 5, 1936, pp. 573-574. In English. Brief report on original work shows that no irreversible heat process takes place, that the transition point is a few hundredths of a degree higher than it should be, and that the magnetic field within the body is increased gradually in the transition range. EF (12)

Creep of Boiler Tubes (Über das Kriechen wärmebeanspruchter Kesselrohre) Kurt Adloff. *Wärme,* Vol. 60, May 1, 1937, pp. 278-285. Theoretical research. Continuing previous research (*Metals and Alloys,* Vol. 6, Feb. 1935, p. MA 74R/1) the earlier formula which proved to be too complicated for practical use, is replaced by a new one. Graphical evaluation and application to various tube diameters and modern high pressure boilers is discussed. EF (12)

On the Creep of Solids at Elevated Temperatures. A. Nadai (Westinghouse Co.) *J. Applied Phys.,* Vol. 8, June 1937, pp. 418-432. Mathematical treatment of the behavior of a solid under combined stresses when a steady state of creep is assumed to exist, i.e., the material yielding at constant rate under a given constant stress. While in polycrystalline metal at low temperatures small plastic deformations are measured by the octahedral shear and the shearing stress is a function of this shear, deformation at high temperatures takes place by slow flow in which the shearing stress is independent of the amount of creep and is a function only of the strain rate. There are certain analogies between the stress distributions in the steady flow of a perfectly viscous substance and in an incompressible elastic solid with the same boundary conditions. Special cases are treated in which the stress strain-rate relation is a simple power function. Various types of flow, for both a plastic strain-hardening material and one perfectly viscous as well as intermediate types, may be treated by changing the exponent in the power function. Cases treated include the thick-walled cylinder with closed ends loaded by internal pressure, the cylindrical cavity, and a disk with a circular hole and stretched in its plane. Equations giving the steady-state stresses and also the stress concentration factors in creep are given. HFK (12)

The Chemical Properties and Stability of Metals at High Temperatures. C. H. M. Jenkins (Metallurgy Dept., Natl. Physical Lab.) *Engineer,* Vol. 163, Apr. 30, 1937, p. 520. See *Metals and Alloys,* Vol. 8, Oct. 1937, p. MA 631L/9. LFM (12)

13 · CORROSION AND WEAR

V. V. KENDALL, SECTION EDITOR

Some Properties of Commercial Steel Sheets Containing Additions of Copper, Manganese, Chromium, and Phosphorus. S. C. BRITTON (L. M. S. Railway) *J. Iron Steel Inst., London,* Advance Copy No. 3, Apr. 1937, 13 pp.; *Iron & Steel Ind.,* Vol. 10, May 5, 1937, pp. 446-452. Research. An examination was made of 6 commercial steels in sheet form, having addition of 1 or more of the elements Cu, Cr, Mn, Si, and P. Atmospheric corrosion tests on small samples at Derby showed, after 300 days, the following reductions in the rate of corrosion from that of a steel of ordinary quality containing 0.09% Cu: of 30-32% for additions of Cr, Cu, P and Si, 19-27% for additions of Cu and Cr, and 12-14% for additions of Cu with or without Mn. With painted samples there was little difference in the time taken for rust to appear, but the high-P steels appeared to advantage after rusting had made some progress. All steels tested had good mechanical properties, the ductility of steels high in P and Si being equal to that of the others. All steels showed a slight reduction in ductility and increased hardness on aging after straining, but in no case was aging sufficiently marked to affect the practical usefulness. Cupping tests were found to be most satisfactory for following aging. 20 references. JLG + CMS (13)

Electrochemical Techniques in Corrosion Study. R. M. BURNS (Bell Tel. Lab.) *J. Applied Phys.,* Vol. 8, June, 1937, pp. 398-403. General discussion of the processes of corrosion in the presence of moisture and the methods whereby these may be studied. Corrosion processes have been discussed previously (see *Metals and Alloys,* Vol. 7, p. MA 509R/3). In place of the time-consuming corrosion tests or the unrelatable accelerated corrosion tests the author advocates the study of corrosion processes with experimental methods having sensitivity high enough to measure the actual rates of reaction in natural environment. Measurement of the potential of a material in a known environment will show whether a metal surface is in a corroding or passive state and may be made with potentiometers or vacuum tube electrometers. Several examples of the use of potential vs. time curves are given. The oscillograph makes possible a study of the existence and stability of passive surface films. A new instrument, known as the polarigraph, allows a measurement of the rates of corrosion reaction especially in the initial stages and possesses both speed and high sensitivity. HFK (13)

Study on the Passivity of Iron and Steel in Nitric Acid Solution. Report XVII. YÔICHI YAMAMOTO. *Bull. Inst. Phys. Chem. Research, Tokyo,* Vol. 16, June 1937, pp. 383-396. In Japanese. *Sci. Papers Inst. Phys. Chem. Research, Tokyo,* Vol. 31, June 1937, Abstracts Supplement, p. 32. In English. Original research. The influence of temperature on the dissolution and the appearance of the passivity of Fe in HNO_3 was electrochemically studied. The dissolution of Fe is assisted by a rise in temperature and the appearance of the passivity phenomenon is retarded. On the other hand, the decomposition voltage of the HNO_3 solution is lowered with the rise in temperature, and the ability to make Fe passive is aided by the lowering of the voltage, so that the value of the voltage necessary to make the Fe anode passive becomes a minimum at 30° C. The Fe sample which was immersed in the HNO_3 solution (41% concentration) at 30° C. became passive, but the solution at 20° C. and at 40° C. failed to make the Fe passive. (For previous research see *Metals and Alloys,* Vol. 8, Sept. 1937, p. MA 577L/1. EF (13)

Application of Potentiometric Methods for the Study and Prediction of Corrosion of Ferrous Alloys (Application des Méthodes Potentiométriques à L'Étude et à la Prévision de la Corrosion des Alliages Ferreux) H. THYSSEN & J. R. MARECHAL (Univ. of Liège) *Rev. Universelle Mines,* Vol. 13, July 1937, pp. 310-312. The theory of GUITTON (see *Metals and Alloys,* Vol. 8, July 1937, p. MA 439L/5) according to which the tendency to corrode of a ferrous metal can be determined by potentiometric measurements, was critically investigated. Some anomalous cases of passivity were found. Ha (13)

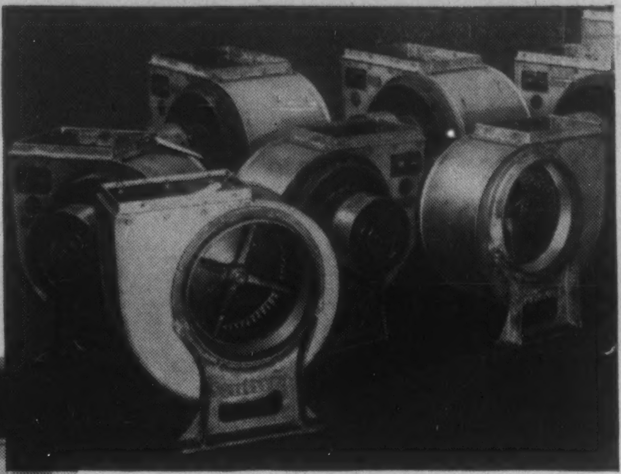
The Influence of the Mean Stress of the Cycle on the Resistance of Metals to Corrosion-fatigue. H. J. GOUGH & D. G. SOPWITH (Natl. Physical Lab.) *J. Iron Steel Inst., London,* Advance Copy No. 6, Apr. 1937, 21 pp.; **The Resistance of Metals to Corrosion Fatigue; Influence of the Mean Stress of the Cycle.** H. J. GOUGH & D. G. SOPWITH. *Iron & Steel Ind.,* Vol. 10, May 5, 1937, pp. 413-417. Original research. 6 materials have been tested: 0.5% C steel, 3 non-corroding steels of various compositions, Duraluminum, and a Mg alloy containing 2.5% Al. The fatigue resistance of each material was determined both in air and in an air-borne salt spray, under 2 types of cycles of direct stresses: (a) repeated tensile stresses and (b) fluctuating tensile stresses, having a rather high mean stress value. No evidence is shown of a corrosion-fatigue limit for any materials tested, the general form of the curve for any material is unaltered by varying the mean stress. In most cases, the effect of variation of the mean stress of the endurance range in salt spray is similar to that on the fatigue range in air. 3 tables and 12 figures. **The Corrosion-fatigue Resistance of Steel; Effect of Protective Coatings.** D. G. SOPWITH & H. J. GOUGH. *Ibid.,* pp. 417-421; **The Effect of Protective Coatings on the Corrosion-fatigue Resistance of Steel.** D. G. SOPWITH & H. J. GOUGH (Natl. Physical Lab.) *J. Iron Steel Inst., London,* Advance Copy No. 13, Apr. 1937, 25 pp.; *Engineering,* Vol. 143, May 7, 1937, pp. 533-535; May 14, 1937, pp. 559-560. Original research. Tests were made to determine suitability of various protective coatings applied to streamline wire subjected to alternating stresses in a spray of sea water. Fatigue resistances, under reversed bending tests in air and in salt spray, were determined on material as-drawn and normalized uncoated and with the following coatings: (1) Zn, applied by galvanizing, sheradizing, and electroplating; (2) sprayed Al, with enamel and without enamel; (3) electrodeposited Cd, alone and with supplementary coatings of enamel and linseed oil; (4) phosphate plus enamel; and (5) enamel only. A very satisfactory degree of protection was afforded by galvanizing, sheradizing and sprayed Al plus enamel. Zn and Cd plating and sprayed Al alone gave a fair degree of protection. Phosphate treatment plus enamel and enamel alone gave considerably better results than the uncoated material, but were not nearly so good as the metallic coatings. Enamel was a useful addition to sprayed Al, but both enamel and oil reduced the degree of protection afforded by Cd plating. 9 references. CEJ + JLG + LFM (13)

Method for Testing the Resistance of Stainless Steels to Local Corrosive Attack. SVEN BRENNERT. *J. Iron Steel Inst., London,* Advance Copy No. 2, Apr. 1937, 11 pp.; *Iron & Steel Ind.,* Vol. 10, May 5, 1937, p. 455. Original research. A new corrosion testing method is described, by means of which numerical values can be given for the resistance of stainless steels to the formation of pits. It consists in determining the anodic potential which can be applied to the metal surface without any "break through" taking place. The potential is measured against that of a saturated calomel electrode. The break-through potential of steels of the stainless type increases as the Cr increases. The method indicates only whether attack will occur, and the values furnish no measure of the velocity at which the material will corrode if corrosion does take place. JLG + CEJ (13)

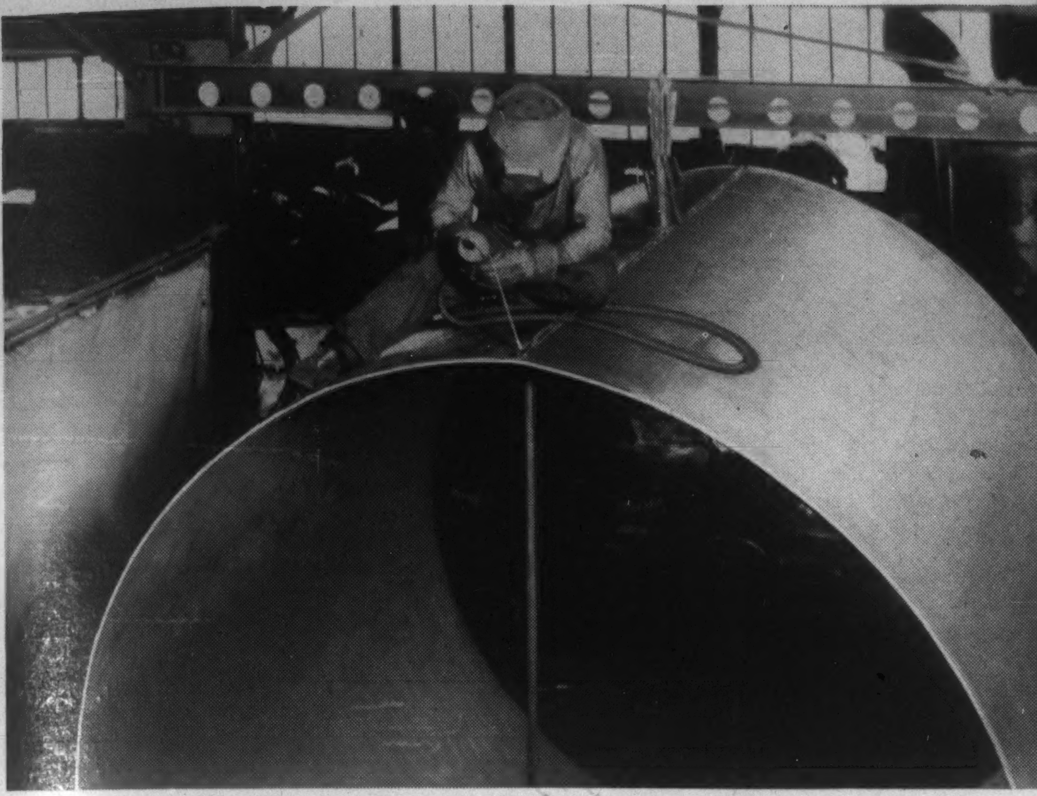
Discussion on Corrosion (Diskussionsinlägg om korrosion) S. PALMAER & SVEN BRENNERT. *Tek. Tid.,* Vol. 67, June 12, 1937; July 10, 1937 (Section *Kemi*), pp. 45-50, 56-61. Discussion of Sven Brennert's article: "Corrosion in Neutral Solutions with Particular Reference to the Rusting of Iron and Steel." See *Metals and Alloys,* Vol. 8, Oct. 1937, p. MA 634R/1. BHS (13)

The Thickness of Oxide Films on Iron. H. A. MILEY (Cambridge Univ.) *J. Iron Steel Inst., London,* Advance Copy No. 10, Apr. 1937, 16 pp; *Iron & Steel Ind.,* Vol. 10, May 1937, p. 454. See *Metals and Alloys,* Vol. 8, Oct. 1937, p. MA625L/2. JLG + CMS (13)

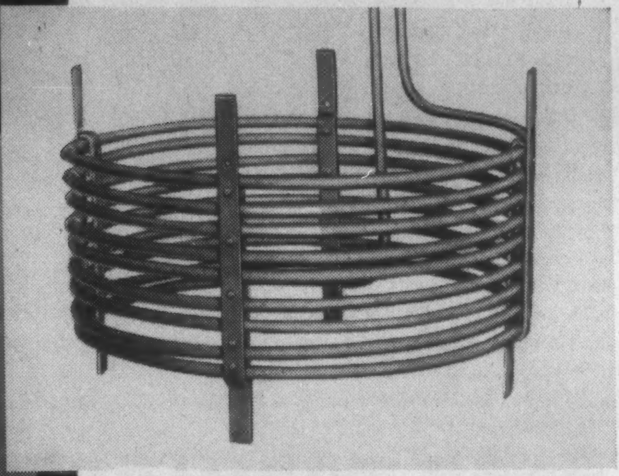
This versatile metal may help *you*



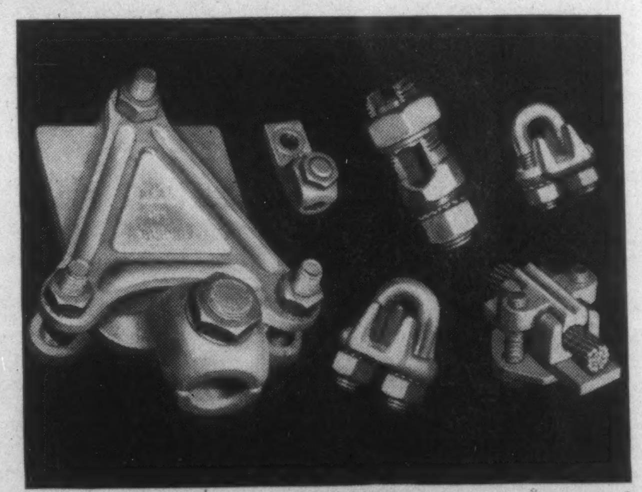
A group of multivane fans for a southern university. Made of non-rust EVERDUR to assure excellent resistance to corrosion.



Electric welding a longitudinal seam on a 10,000 gallon EVERDUR pressure vessel. Both tank stock and welding rod are EVERDUR Silicon Bronze.



This heating coil was made of EVERDUR tubing to provide long life under exceptionally corrosive conditions.



Typical cast EVERDUR connectors and accessories, with EVERDUR bolts, nuts and lockwashers.

STRONG

Everdur Silicon Bronze provides the strength of medium carbon steel — added assurance against failure — extra dependability.

TOUGH

Toughness to guard against breakage by shock—to withstand the vibration inherent in many types of structures and equipment.

CORROSION-RESISTANT

With exceptional resistance to a wide range of corroding agents, Everdur is a favorite metal of the chemical, processing, and air-conditioning industries.

WORKABLE

Readily workable either hot or cold, Everdur has the fabricating qualities of steel. It can be stamped, spun, forged, pressed, machined, cast, etc.

WELDABLE

Using rod of similar composition, Everdur is readily welded by all the usual methods; oxy-acetylene torch, carbon arc or metallic arc.

NON MAGNETIC

This characteristic of Everdur has many self-evident and important applications in the electrical field.

MODERATELY PRICED

Yet, with all these qualities, you pay less for this copper-base alloy than for other types of special, corrosion-resisting metals. Everdur is available in all commercial forms. Further information sent on request.

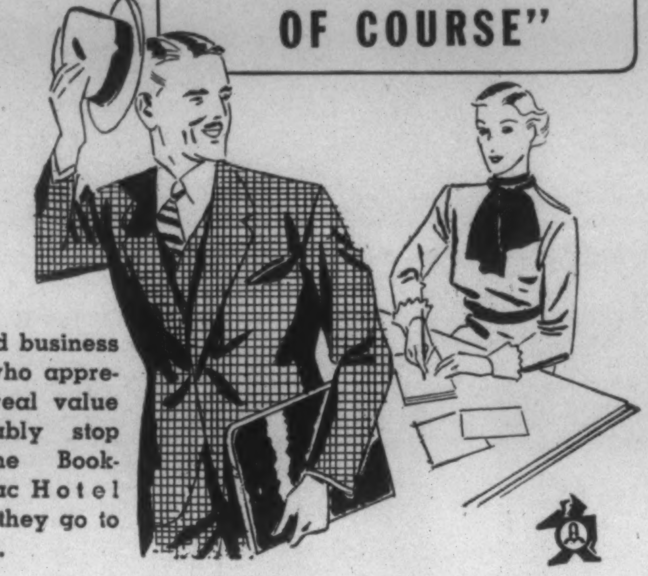
3795

ANACONDA
from mine to consumer

Everdur SILICON BRONZE

THE AMERICAN BRASS COMPANY, General Offices: WATERBURY, CONNECTICUT
Offices and Agencies in Principal Cities • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

[EVERDUR is a trade-mark of The American Brass Company, registered in the United States Patent Office.]



"I'LL BE AT THE BOOK-CADILLAC OF COURSE"

Shrewd business men who appreciate real value invariably stop at the Book-Cadillac Hotel when they go to Detroit.

They like the comfort of its 1200 cheerful, modern rooms . . . all with bath and circulating ice water. Friendly service and modest rates. Famous food in five beautiful restaurants.

BOOK-CADILLAC HOTEL

DETROIT

W. O. Seelbach, Manager *W. J. Chittenden, Jr.,* Resident Manager
1200 rooms . . . minimum rate $3
National Hotel Management Company, Inc. *Ralph Hitz,* President

Surface-passivity and Inner-corrosion of 21% Cr Stainless Steel in Acid Solutions Containing Chlorine and a Cation of Higher Valency. H. ENDO & S. MORIOKA. *Nippon Kinzoku Gakukai-Si,* Vol 1, June 1937, pp. 71-79. In Japanese. Original research. Surface-passivity of 14 and 21% Cr stainless steels in a solution of 10% FeCl$_3$ was tested; the former is severely attacked while the latter is not, retaining metallic lustre provided the portion of the contact surface of the specimen and glass supporter forms a pit when attacked. A discussion of this phenomenon is made, taking the non-metallic inclusion, pits and fissures on the surface of the specimen into account. These undesirable inclusions, pits and contact portion with non-conductive substances act as capillary crevices on the surface. The latter becomes anodic while the other portions of the surface are subjected only to the action of oxidation and remain in a passive state. The activity or passivity of the specimen is dependent on the amount of Cr content in the specimen and the kind of acid in solution. KT (13)

A Practical Trial of Roofing Sheets of Copper Steels and Other Materials, with the Results as Regards their Corrosion after a Period of Exposure of 9¾ Years to Date. ROBERT HADFIELD & S. A. MAIN (Hadfields, Ltd.) *J. Iron Steel Inst., London,* Advance Copy No. 7, Apr. 1937, 5 pp.; *Iron & Steel Ind.,* Vol. 10, May 5, 1937, pp. 453-454; *Iron & Coal Trades Rev.,* Vol. 134, Apr. 30, 1937, pp. 796-797; May 21, 1937, p. 923; *Engineering,* Vol. 143, May 7, 1937, p. 537; May 21, 1937, p. 585. Original observations. Both painted and unpainted galvanized sheets were exposed on 4 roofs at a Sheffield steel mill for 9¾ yrs. Only the unpainted sheets have been corroded sufficiently to give useful results so far. Cu-bearing steels have proven definitely superior to ordinary steel, but their merits did not appear until the galvanized coating had weathered off. Ingot Fe was definitely inferior to ordinary steel. Severity of corrosion was judged by loss in thickness. JLG + CMS + Ha + LFM (13)

Some Scientific Aspects of the Cleaning of Ferrous Metals (Quelques Aspects Scientifiques du Problème du Decapage des métaux Ferreux). E. HERZOG. *Métaux et Corrosion,* Vol. 12, Mar. 1937, pp. 52-58. General review of the mechanical and chemical descaling and cleaning of ferrous metals. 27 references. GTM (13)

Rubber-lined Equipment—Fundamental Principles of Design. J. R. HOOVER & H. C. KLEIN (B. F. Goodrich Co.). *Ind. Eng. Chem.,* Vol. 29, Apr. 1937, pp. 394-397. Descriptive and practical. The function of rubber linings in chemical equipment is protective, not structural. The requirements in the choice of structural materials, the type of design, the condition and accessibility of surfaces to be lined, the intended use of the piece, conditions of operation, are presented. A brief description of how the rubber linings are generally applied, is also given. MEH (13)

Corrosion as Influenced by Increased Temperature. U. R. EVANS. *Iron & Coal Trades Rev.,* Vol. 134, Apr. 23, 1937, p. 748; *Iron & Steel Ind.,* Vol. 10, May 1937, pp. 390-391; *Engineer,* Vol. 163, Apr. 30, 1937, pp. 519-520. Paper read before London Congress Intern. Assoc. Testing Materials, Apr. 1937. Review. Oxidation at high temperatures, and the physical and chemical relations between metals and the oxides formed, are discussed. The effect of oxide density on the protectiveness of the coating, and the use of alloying elements (Cr, Al, Si) to modify the physical nature of the scale are stressed. Formulas for oxidation rates of oxide-forming metals are given and their practical application discussed. Ha + CEJ + LFM (13)

Surface Attacks in Light Metals (Oberflächenangriffe bei Leichtmetallen). H. A. J. STELLJES. *Aluminium,* Vol. 19, May 1937, pp. 291-298. General discussion. Some corrosion phenomena on the surface of pure Al, especially in house—and kitchenware, have not yet found a satisfactory explanation and were examined more closely. Water from "sweating" in storing should be prevented by proper temperature conditions as it causes corrosion. Local attack is often due to non-metallic inclusions like carbides, nitrides or oxides. Unsatisfactory cleaning often leads to attack. Characteristic appearance is shown in photographs, and means for prevention or removal of stains discussed. Ha (13)

Oxidation of Fusible Elements. G. W. NICHOLSON. *Electrical Rev.,* Vol. 120, Apr. 2, 1937, p. 500. Formation of oxides on elements used in electrical fuses has marked bearing on time necessary for rupturing. Extent of oxidation depends upon age under working conditions, time of exposure, temperature, and resistance of oxide formed to cracking. The higher the % of overload allowable the lower will be the temperature under normal working conditions and the less tendency there will be to oxidize. Ag oxidizes least and thus insures greater constancy of current than other metals used. It is expensive, however, and is not strong enough mechanically for use with small currents. Of the other metals, Sn is affected least by moist air. It also has little tendency to oxidize at low working temperatures and is much used for coating other metals, particularly Cu. MS (13)

Surface Protection of Light Metals (Oberflächenschutz von Leichtmetallen). A. KOPPENHÖFER. *Aluminium,* Vol. 19, May 1937, pp. 315-318. Discusses three groups of light metals for use in construction of airplanes: (1) Unalloyed light metals—Al. (2) Low-alloyed light metals—Al-base with Mg, Mn, Si up to 2% each. (3) Higher alloyed light metals—Al-base with Cu, Mg, Mn, Si—Mg-base with additions of Al and Zn (Electron group). The last group possesses the highest strength, but is most susceptible to corrosion, both surface corrosion and intercrystalline corrosion. Protection is obtained by plating, alloying and lacquering; the various processes are reviewed. Ha (13)

Possible Action of Inhibitors During the Attack of Acid Solution on Iron (Sur un Mode d'Action Possible des Limiteurs d'Attaque du Fer en Solution Acide). G. LEJEUNE & P. A. JACQUET. *Bull. Soc. Chim.,* Vol. 3, Nov. 1936, pp. 2137-2142. Original research. The weight loss of an Fe sample immersed in 10% H$_2$SO$_4$ at 20°C. for 1 hr. drops 39% due to the addition of .05% gelatine in a glass beaker, but only 16% if a Pt vessel is used. Other tests indicate that the inhibitive action of gelatine added to acid solutions is due to the increase in over-voltage of Fe. The equilibrium of the ionic layers in contact with the metal surface is upset decreasing the difference between these layers and the remainder of the solution. The rate of diffusion drops resulting in a reduced rate of attack. The increase of inhibiting action with rising temperatures is attributed to 2 opposing factors: the increase of over-voltage with the rate of attack and its decrease with increasing temperatures. The increase of the inhibiting effect of the gelatine with current density is more important than the decrease of the over-voltage due to increase of temperature. EF (13)

What Voltage Needed to Protect Pipe Lines. D. B. GOOD (Texas Empire Pipe Line Co.). *Oil & Gas J.,* Vol. 36, June 24, 1937, pp. 64, 66, 69. General review of principles of cathodic protection of pipe lines. O.3 volt is sufficient to protect a coated pipe line. Cost figures are given. VVK (13)

The Evans Phenomenon on Impure Iron Caused by Active Dust (L'Effet Evans se Produit sur le Fer Impur et à Pour Origine les Poussières Actives). Paul Ronceray. *Bull. Soc. Chim.*, Vol. 4, Aug.-Sept. 1936, pp. 1661-1666. Original research of fundamental nature. A few drops of NaCl solution (.005%) and the same quantity of distilled water were placed on a carefully polished, pickled, washed and dried sheet of ordinary Fe and the course of corrosion was closely observed. Corrosion started under only half of the H_2O drops, one of which showed the Evans phenomenon as did the NaCl solution drops although to a lesser extent. The clear zones in the H_2O drops are not as wide as those of the NaCl solution drops, all of which caused corrosion to start in 6 min. There were 3 zones of corrosion after 1½ hrs., i.e. a clear region at the outer edge, followed by a ring of rust and a voluminous yellowish precipitate in the center. On removing the corrosion products, the center was found to be only very slightly corroded; the surrounding ring exhibited a more pronounced attack, while a groove appeared on the outside. The indications are that there is no transference of Cl from the interior to the exterior of the drop. The assumption that corrosion is due to the O-Fe couple is questioned, as the rust is greatest where the attack is most pronounced i.e. at the periphery. Ronceray concludes that Evans and Herzog and Chaudron were misled by failing to account for the effect of active dust on the surface. The Evans effect (rust-Fe couple) occurs only if the Fe has been thoroughly cleaned. **Concentrated Copper Sulphate Solution Placed on Impure Iron, Polished and Free from Active Dust—A Phenomenon Resembling that of Evans' for Rust (Le Sulfate de Cuivre en Solution Concentrée donne sur le Fer Impure, poli et Dépourvu de Poussières Actives, un Phénomène Rappelant celui d'Evans pour la rouille).** *Ibid.*, pp. 1687-1689. Fe samples were prepared by 2 methods: (a) polishing with 000 emery, alcohol washing and drying, (b) same as (a) except additional high polish with rouge, washing in alcohol and drying. Dropping a 30% $CuSO_4$-solution on (a) deposited powdery red Cu instantly. On spreading, further Cu was deposited but no further changes were noticeable during the following 45 min. Removing the deposit, annular zones of corrosion were noticed, the slightest attack being at the periphery. On (b) a crystalline, lustrous deposit of Cu slowly appeared over the entire surface. At the edge, a turbid annular red deposit formed which spread inward after 30 min. At the outside of this, a region of clear blue $CuSO_4$ solution with corroded Fe underneath and no Cu deposit was observed. After the deposit was wiped off, there was a slight corroded outer zone, a heavily attacked intermediate ring and a moderately corroded center. It is concluded that active dust particles caused powdery red Cu to deposit. In the absence of active dust, a brilliant Cu deposit is formed outside of which Fe may be attacked after spreading of the drop, without deposition of Cu. In the blue zone, the corrosion may be that of a cathode of a cell whose previously deposited Cu becomes the anode. A general circular cell, secondary to the first phase of the corrosion, inhibits the functioning of the local cells present in the blue zone. The action of the weak current of the local cells is overcome by the heavy current from the more general cell which alone causes a corrosion attack in the blue zone. The latter does not occur in the case of granular central deposits that lack continuity and do not offer the possibility of a general cell. Many intense local cells are created instead. **On Impure Iron, the Evans Phenomenon is Affected by the Moisture Content of the Air and the Concentration of the Salt Solution (Sur le Fer Impur, le Phénomène d'Evans est Conditionnée part l'État Hygrométrique de l'Air et la Concentration de la Solution Saline).** *Ibid.*, Oct. 1936, pp. 2077-2084. The variations in atmospheric humidity and NaCl concentration and the presence of dust particles may account for the disagreeing conclusions of Evans, Herzog and Chaudron on one hand and Maass and Liebreich on the other hand. The theory of gas concentration cells does not fully interpret the Evans phenomenon. **A Concentrated Copper Sulphate Solution, Placed in Drop Form on Impure Iron, Polished and Free of Dust, Produces Three Phenomena: An Aureole, a Film and an Evans "Pseudo-Effect" (La Solution Concentrée de Sulfate de Cuivre, en Goutte sur le Fer Impure Poli et sans Poussières, Donne Lieu à Trois Phénomènes: "Aureole," "Taie," "Pseudo-phénomène d'Evans")** *Ibid.*, pp. 2084-2087. Placing drops of $CuSO_4$ on Fe, metallic Cu deposits along the periphery of the drop, inside of which follows an annular opal-like film brought about by the action of local cells of Fe-Cu. This zone is followed by a clear blue region surrounding a center filled with Cu deposit ("Evans pseudo-effect"). The "reactional antagonism" (see *Metals and Alloys*, Vol. 8, Apr. 1937, p. MA 232 R/1-9) between the opal-like film and the red Cu aureole is attributed to the opposition of galvanic currents responsible for either phenomenon. **The Corrosion of Iron by Copper Sulphate Solution, in Drop Form and in Open Air, is Determined by Three Mechanisms: The Local Cell, the Salt Concentration, and the Circulatory Copper-Iron Couple (A l'air Libre, la Corrosion du Fer par la Solution du Sulfate de Cuivre, en Goutte, est Conditionée par Trois Mechanisms: Pile Locale, Pile de Concentration Saline, Pile Circulare Fe-Cu)** *Ibid.*, pp. 2088-2092. Results of drop tests indicate that active dust particles play a rôle in the deposition of Cu on Fe surfaces. Finds further evidence that "reactional antagonisms" exist between the different types of cells within each individual drop. The corrosion attack on Fe depends on (a) the concentration of the $CuSO_4$ solution and (b) the atmospheric moisture content. The latter influences the mechanism of the concentration cell. In air saturated with moisture, the local cell is the principal corrosion factor. EF (13)

Greasing of Transmission Cables (Das Fetten von Freileitungsseilen). P. Behrens (Lautawerk). *Aluminium*, Vol. 19, May 1937, pp. 318-321. Report of investigation. Tests over 5 years with Al wires and ropes stretched in open air near the sea coast proved that coating with an appropriate oil, preferably vaseline, protects fully against attack by the salty atmosphere. A slight coating is also good for high and low tension lines in cities or districts with corrosive atmosphere. Suggestions for best method of greasing the interior and exterior of the ropes are made. See *Metals and Alloys*, Vol. 6, Oct. 1935, p. MA418R/10. Ha (13)

Effect of Pressure on the Attack of Hydrogen Sulphide on Steels. II, Chromium-iron and Nickel-iron (Über den Einfluss des Druckes beim Angriff von Schwefelwasserstoff auf Stähle. II, Chromeisen, Nickeleisen) Egbert Dittrich. *Chem. Fabrik*, Vol. 10, Mar. 31, 1937, pp. 145-150. Original research. The resistance of several Cr-Fe, Ni-Fe and Cr-Ni-Fe alloys to H_2—H_2S mixtures between 300° and 500°C. was investigated. The gas pressure was varied between 1 and 75 atm., of which 0.8 to 12 atm. represented the partial pressure of H_2S. The resistance of a given alloy decreased with rising temperature. With Fe-Cr alloys, resistance increased with the Cr content, at atm. pressure; at higher pressures, increasing Cr content first reduces and then increases the resistance to corrosion. With Ni-Fe alloys, the resistance at 400° C. and atm. pressure decreased proportionately with increasing Ni content (at least up to 60% Ni); at higher pressures the resistance decreases even more rapidly with rising Ni content. At 500°C. and higher pressures there occurs first an improvement and then a rapid lowering of the resistance as the Ni content is raised. Under certain conditions, therefore, the presence of Ni may be helpful. This is clearly shown by the Ni-Fe-Cr alloys containing 20% Cr, for of these, the Ni-free alloy was less resistant than the 8% Ni alloy, which in turn was less resistant than the 40% Ni alloy. Further addition of Ni, however, reduces the resistance; 80% Ni, 20% Cr was the most rapidly attacked of the binary or ternary alloys containing 20% Cr. A theory of sulphidation is offered in explanation. See *Metals and Alloys*, Vol. 6, Nov. 1935, p. MA 462R/1. FPP (13)

Theory of Metal Potentials I. The Local Element Theory of Metal Potentials and Its Application to the Electromotive Behavior of Metals in Oxygen-free Solutions (Zur Theorie der Metallpotentiale I. Die Lokalstromtheorie der Metallpotentiale und ihre Anwendung auf das elektromotorische Verhalten der Metalle in sauerstoffreien Lösungen) W. J. Mueller (Techn. Hochschule, Wien) *Sitzber. Akad. Wiss., Wien. Math.-Naturw. Klasse, Abt. IIb*, Vol. 145, No. 9, 1936, pp. 1013-1031. Review plus original research. The previously advanced formula for the potential of a metal surface covered with a coating has been revised to take into account the changes of the concentration of the metal ions and the change of pH. The equation, which holds only for solutions free of air and O_2, is discussed at great length and testing results obtained on Ni, Fe and Zn are interpreted in the light of the new formula. The author claims that the latter completely covers the behavior of the potential of metals and that the great many hypotheses introducing factors like reaction inertia, formation of H-alloys, setting-up of adsorption potentials, passivity phenomena, etc., can be discarded. **II. Metal Potentials in Oxygen-containing or Oxidizing Solutions (Die Lokalstromtheorie der Metallpotentiale. II. Metallpotentiale in sauerstoffhaltigen oder oxydierenden Lösungen)** *Ibid.*, Vol. 145, No. 10, 1936, pp. 1107-1115. Theoretical. Equations are derived showing that the equation of diffusion velocity holds true also with reference to the corrosion rate of a metal in the presence of oxidizing agents as well as in the case of pure chemical attack. The validity of the diffusion velocity rule does not warrant a definite conclusion as to whether the corrosion is due to a local element effect or to pure chemical reaction. With the occurrence of local elements, a potential change occurs which is proportional to the concentration of the oxidizing medium and the resistance in the pores. The differential effect is nil if the area of the auxiliary cathode equals the total area of the local element cathodes. EF (13)

External Corrosion. J. P. Morrison. *Locomotive*, Vol. 41, Apr. 1937, pp. 171-176. General discussion of corrosion of steel surfaces, particularly in pressure boilers. HA (13)

Uses of Modern Metals and Alloys in Chemical Industry (Les Applications des Métaux et Alliages Modernes dans l'Industrie Chimique) PAUL BASTIEN. *Tech. Moderne,* Vol. 28, Sept. 15, 1936, pp. 633-637. Reviews important corrosion resisting alloys. (1) Stainless steels: Cr steels resist oxidizing chemical attack very well, but they are corroded by H_2SO_4 and HCl. Ni-Cr austenitic steels are not corroded by boiling HNO_3 in concentrations from 30-70%. Their resistance to HCl and H_2SO_4 is good in some cases. Corrosion by HCl is reduced by higher Ni contents and corrosion by H_2SO_4 is lessened by Si additions. 18/8 steel is most widely used. Si additions increase heat resistance. Some special austenitic steels of the Ni-Mo or Ni-W types find use in contact with HCl and H_2SO_4. (2) Cast Fe resistant to corrosion: Si cast Fe containing 13-19% Si resists oxidizing media such as nitric, chromic and phosphoric acids very well, and cold HCl and H_2SO_4 fairly well, but is corroded by the same acids when hot and by by caustic products. Due to their poor foundry properties they are only cast in simple shapes. Ni cast Fe containing 2-5% Ni has good resistance to caustic soda and potash. Austenitic Cu-Ni-Cr cast irons are now widely used, as they are considerably more resistant than ordinary cast Fe to acids, sea water etc. (3) Cu alloys are used for handling sea water, superheated steam, etc. (4) Ni and its alloys: Ni is slowly attacked by HCl and H_2SO_4 but rapidly by HNO_3. It resists dissolved or molten alkalis excellently, and is used to make tanks for transportation of such materials. (5) Lead is chiefly used in contact with H_2SO_4. It is often used to coat steel parts. (6) Al resists HNO_3 and food acids. FR (13)

The Deaeration of Boiler Feed Water. R. W. BRUNNER. *J. Am. Soc. Naval Engrs.,* Vol. 49, May 1937, pp. 127-152. Clear, concise outline of corrosion theory showing part O_2 plays in depolarization, and in increasing surface exposed by roughening due to oxide formation. Due to increased pressures and ratings for Naval boilers with lower weight factors, the structures are more vulnerable and therefore require increased attention to lower the corrosion rate. Simple calculation shows that a modern destroyer at 15 knots cruising rate with .4 ml O_2 per 1. as measured recently on board ship would corrode over ½ lb. of Fe from boilers and tubes in 24 hours. Reduction in dissolved O_2 by deaeration is considered proper answer to problem and discussion is given of various systems of deaerating which are illustrated in sketches and diagrams. Method of testing for dissolved O_2 in use by Navy is modified Winkler test which is the only one available at present. Attention is being given to spectrophotometer method of testing which with further development may indicate critical limits. The modified Winkler test is described as requiring extreme precautions in sampling and in basing the determination on several simultaneous tests. Tests are tabulated for various parts of the feed water system to indicate variations in O_2 content along the line. Present aim is to reduce this to a .10 ml/l. max. Chemical control of O_2 is not feasible due to large amounts of chemicals that would be required in ships stores for the purpose. WB (13)

The Passivity of Chromium (Zur Passivität des Chroms) ERICH MUELLER & V. CUPR. *Z. Elektrochem.,* Vol. 43, Jan. 1937, pp. 42-52. Pure Cr is polarized cathodically and anodically in different acid solutions against a Pt electrode. Apparatus is so designed that a photographic record of the variation of potential of the Cr against a normal calomel electrode with time and of the current flow with time is obtained on the same record. Activating potentials of Cr in HCl, H_2SO_4, HBr and $HClO_4$ during self-polarization were found to vary with pH thus

$$\pi a S = MS + 0.058/og\ [H^+]$$

where MS is the breaking-through potential for self-polarization. Exactly similar equations hold in the case of cathodic and anodic polarization. In self-polarization the type of union does not influence the breaking-through potential while for cathodic and anodic polarization the values of this potential in volts for Cl^-, SO_4^{--}, Br^- and ClO_4^- were —.505, —.523, —.530, —.564 and —.519, —.554, —.546 and —.559 respectively. For the same [H +] the activation potential in cathodic polarization is greater for HCl and HBr than for H_2SO_4 and $HClO_4$. The passivation potential in anodic polarization is less for HCl and HBr than for H_2SO_4 and $HClO_4$. HAS (13)

Protection of Metallic Underground Ducts Against Electrolytic Corrosion (Protection des Canalisation Métalliques Souterrains contre les Corrosions Électrolytiques) M. GUILLOT. *Rev. gén. élect.,* Vol. 41, June 19, 1937, pp. 795-800. Review. The causes of electrolytic corrosion by stray currents in the ground are explained. Two classes of protection have been developed, those suppressing the cause of the stray currents, and those assuring a protection against the electrochemical attack by coating, insulation or anodic protection. A new method consists in coating the metal with a conducting envelope which itself is not liable to corrode, e.g. graphitized caoutchouc. This forms a kind of electronic filter. 9 references. Ha (13)

Scale and Corrosion Control in Aqueous Systems. D. W. HAERING. *Water Works & Sewerage,* Vol. 83, Aug. 1936, pp. 275-278. General discussion. Scale formation in water pipes can be considered as crystallization from supersaturated solutions at heat transfer surfaces. The usual method of prevention is complete removal of the objectionable salts before using the water. Corrosive agents may be O, CO_2, alkalis, nitrates, chlorides and galvanic couples. Inhibitors and passivators are used to prevent corrosion, e.g. sodium silicate. The various methods of improving conditions are discussed. Ha (13)

Corrosion Tests in Professor Palmaer's Laboratory (Essais de Corrosion au Laboratoire du Professeur Palmaer) N. GOLDOWSKI. *Métaux et Corrosion,* Vol. 12, Mar. 1937, pp. 58-62. Descriptive. Palmaer accelerated corrosion testing method requires samples 5 x 2 cm. After polishing and cleaning, these samples are dipped into a 5.5 *N* solution of $CaCl_2$. The excess liquid is removed by means of filter paper, leaving on the surface a liquid film of about 0.02 mm. thickness. The sample is then suspended in a closed flask filled with air and connected with a calibrated gas burette. A small amount of salt solution in the bottom of the flask provides a constant vapor pressure for maintaining the liquid film on the surface of the sample. The flask is placed in a thermostatic water bath. By measuring the decrease of the gas volume in the flask caused by the oxidation of the test sample, the progress of the corrosion can be followed continuously. Study of the conductivity of the electrolyte showed that the corrosion phenomenon depends on the electrolyte conductivity and on the solution potential of the metal. GTM (13)

Rubber Affords Protection for Machine Parts. FRED KELLY. *Machine Design,* Vol. 9, May 1937, pp. 43-44, p. 55. Descriptive. Rubber plating has eliminated previous difficulties in protecting metallic parts against abrasion and corrosion by rubber linings. Maximum thickness of plating: ⅛ in. Plating may be soft, semi-hard or hard depending on type of service. Typical examples of rubber plated machinery parts are discussed and illustrated. EF (13)

Cavitation in Water Turbines. A. A. FULTON. *Mech. World Eng. Record,* Vol. 101, May 21, 1937, pp. 514-515. Practical. Cavitation can be avoided by correct hydraulic conditions over the whole working surface of the runner and by ensuring the absence of imperfections in the construction material. EF (13)

Corrosion of Waste Heat Boilers Due to Oxygen (Anfressungen durch Sauerstoff in Abhitzekesseln). F. DOMES. *Wärme,* Vol. 60, May 22, 1937, pp. 323-324. Briefly reports on a boiler rendered unserviceable due to oxygen corrosion, the peculiar distribution of which proves that O was the cause of failure. EF (13)

Better Choice of Materials and Improved Lubrication Reduce Wear of Metals. *Steel,* Vol. 100, Apr. 12, 1937, pp. 84-86. Summary of papers by H. W. Gillett, Albert Palmer, N. L. Mochel, L. W. Wallace, G. H. Clamer and W. E. Jominy on factors influencing the wear of metal and methods of wear testing, presented at an A.S.T.M. Symposium. MS (13)

Determining Means of Reducing Pipe Line Corrosion by Analysis of Soil. L. E. BREDBERG (Staff). *Oil & Gas J.,* Vol. 36, June 17, 1937, pp. 63-64. Description of organization, equipment and methods of the soil-testing unit of the Magnolia Petroleum Co. Saturated resistance tests, pH determinations and Corfield nipple tests are made and correlated with the soil survey. VVK (13)

Corrosion Prevention in the Netherlands (La Lutte Contre la Corrosion aux Pays-Bas). G. BATTA. *Métaux et Corrosion,* Vol. 12, Feb. 1937, pp. 35-39. General description of corrosion studies in Holland. GTM (13)

Some Comments on Corrosion in Water Works Practice. C. N. ALEXANDER (Tubize Chatillon Co.). *Water Works & Sewerage,* Vol. 84, Mar. 1937, pp. 99-101. The causes and prevention of corrosion in sewer pipes by atmospheric and soil attack are discussed. Ha (13)

Metals Solving Corrosion Problems with Sewage Treatment Equipment. G. L. COX (Intern. Nickel Co.) *Steel,* Vol. 101, July 19, 1937, pp. 77-78. Present-day trend is toward use of corrosion-resistant metals for vital parts of sewage disposal equipment. Among alloys used are Monel metal, alloyed brass and bronze, steels of the stainless and more highly alloyed corrosion-resistant types, and clad metals such as Ni-clad and stainless-clad. MS (13)

14 · APPLICATION

Wires Employed in Dentistry. EUG. W. SKINNER (Northwestern Univ.) *Wire & Wire Prod.*, Vol. 12, Sept. 1937, pp. 465-468, 496-498. Besides Au and Pt (most widely used), stainless steel wires, mainly of the 18/8 type are employed. Methods of working, forming, joining and heat-treating are described in detail and charts given for mechanical properties at different temperatures. Ha (14)

Development of the Diesel Engine. *Diesel Engine Users' Assoc. Bull. 1936.* S. 138, 53 pp. General review. Reference is made to the use of Al alloy in the top half of big end bearings and of a Pb bronze for both main and big end bearings. Al alloy pistons are used practically universally on high-speed compression ignition engines and the wear on such pistons is small, as these units may be run from 120,000 to 150,000 miles after which there is a danger of failure due to fatigue. Excessive cylinder liner wear has largely been overcome by the introduction of N-hardened cast Fe liners, and hardened piston rings are used with such liners. A new process for the treatment of cylinders and cylinder liners, known as the Listard process, where chromium is electrically deposited on the cylinder bore, gives a surface of great hardness and durability. JWD (14)

Use of Modern Metals and Alloys in the Automobile Industry (L'Emploi des Métaux et Alliages Modernes dans l'Industrie Automobile) PAUL BASTIEN. *Tech. Moderne*, Oct. 1, 1936, pp. 683-686. Review. Motor-cylinder blocks and cylinder liners are cast with a pearlitic cast Fe, an alloy cast Fe containing 1-1.5% Ni and 0.25-0.50% Cr or an alloy cast Fe containing 5% Ni which, through cooling in the mold has a martensitic structure of high hardness. Austenitic cast irons containing 13-15% Ni, 6-8% Cu and 2-4% Cr are sometimes used because their expansion coefficient is the same as that of Al alloys. For crankcases, Al and Mg alloys are used more and more because they provide a substantial weight saving. Permanent-mold casting of such alloys in large and intricate shapes is a recent development. Mg alloys have replaced Al alloys to some extent owing to price changes. In motors with high compression ratio cylinder heads are usually cast with Al alloys. Austenitic cast Fe is used for fitting into Al alloy parts. Al alloy pistons are replacing cast Fe. Alpax, Y and RR alloys are generally preferred in this special application. When the expansion coefficient must be low, hyper silicide Al alloys containing 18% Si and 3% Cu are used. For parts such as piston axles, connecting rods or crankshafts, Ni-Cr or Ni-Cr-Mo steels are of general use. High Ni, Cr and W alloys are used for valves. Frames, gears, pinions, etc., are made of Ni or Ni-Cr steel. Wheels are cast in light alloys when weight saving is of chief importance. Light alloy sheets are also used for body structure to reduce dead weight of the car. FR (14)

14a. Non-Ferrous

G. L. CRAIG, SECTION EDITOR

The Use of Eloxal for Heat Exchanging Apparatus (Zur Verwendbarkeit von Eloxal für Wärmeaustauschapparate) L. LUX (Lautawerk) *Aluminium*, Vol. 19, May 1937, pp. 334-336. Heat radiation from Al surfaces can be extraordinarily increased by eloxation. The radiation in cal./m.^{2} hr. (degree abs.)^4 is for hard, as rolled, pure Al sheet, 0.34; the same polished by polishing roll, 0.20; silumin casting, normal casting skin, 1.60; and pure Al with eloxal layer, 3.62; in comparison, the black body radiation is 4.70, and cast Fe strongly oxidized between 40° and 250° C., 4.39. Tests are described which show that the heat radiated can be increased by eloxation 33-35%; and if the material is first sand-blasted and then eloxated, 50%. The application of this method to engines and radiating apparatus is discussed. Ha (14a)

The "Broduit" Copper Conduit System. *Engineering*, Vol. 143, Feb. 19, 1937, p. 202. Descriptive. I. C. I. Metals, Ltd., of Birmingham, England have developed a Cu conduit system using solid-drawn light-gage unscrewed Cu tubes with boxes and fittings made of Everdur, a Cu-Si-Mn alloy having the strength of medium-C steel and the corrosion-resisting properties of Cu and is non-magnetic and non-sparking. LFM (14a)

Nickel in the Radio Industry. E. M. WISE (Intern. Nickel Co.) *Proc. Inst. Radio Engrs.*, Vol. 25, June 1937, pp. 714-752. Uses of Ni in this industry are enumerated. Methods of producing the refined Ni are outlined. The intrinsic properties rendering Ni applicable to radio tube construction are pointed out. 55 references. WHB (14a)

Hydrosulphites Production. RENÉ FRAENKEL & ANDRÉ DUBOSC. *Chem. Trade J.*, Vol. 100, May 21, 1937, p. 452. Descriptive. Activated Al and Zn are used as reducing agents for production of alkaline hydrosulphite. Metals are immersed in a solution of $HgCl_2$, whereby they become lightly amalgamated on the surface. Activated Zn gives better yield and higher reaction speed than when Zn dust alone is used. Process is somewhat faster when working with activated Al. MS (14a)

Caustic Soda Evaporation. *Chem. Trade J.*, Vol. 100, June 4, 1937, p. 497. Monel metal and Ni have given unusually good service in NaOH evaporators. Pure Ni still is used in distillation of fine perfumes. Trucks handling moist NaCl are lined with Monel metal. Mixing paddles of Monel metal are used in a paste and glue works. MS (14a)

Automobile Metal Failure. R. J. BROWN. *Indian Engineering*, Vol. 101, May 1937, pp. 164-166. Review of metallurgical research to eliminate the failure of certain metals used in the construction of automobiles. APS (14a)

Steel Castings in Hydraulic Turbine Construction. *Engineer*, Vol. 163, Jan. 29, 1937, pp. 126-128. General review. Describes the various alloy steels used in the manufacture of runners and other parts of hydraulic turbines. Illustrations are given showing different types of construction. LFM (14a)

Use of Lead in the Study of Cosmic Rays (L'emploi du Plomb dans l'Étude des Rayons Cosmiques) J. MAHUL. *Tech. Moderne*, Vol. 28, Sept. 15, 1936, pp. 638-641. FR (14a)

Fireman's Helmet of Light Metal (Der Feuerwehrhelm aus Leichtmetall). H. FISCHBACH. *Aluminium*, Vol. 19, June 1937, pp. 417-419. Describes manufacture. Weight of helmet is only 1.4 lbs. Ha (14a)

Use of Synthetic and Domestic Materials in Modern Machinery (Umstellung auf Kunst- und sonstige Heimstoffe im neuzeitlichen Maschinenbau) E. PALLAS. *Wärme*, Vol. 60, May 8, 1937, pp. 294-297. General. Discusses the use of bearings made of pressed resins and of new composite bearings consisting of a steel backing, bronze intermediary layer and white metal bearing surface. Considers some applications and reports practical experience gained. EF (14a)

The Absolute Photoelectric Yields of Mg, Be and Na. MARVIN M. MANN, JR. & LEE A. DUBRIDGE (Univ. Rochester) *Phys. Rev.*, Vol. 51, Jan. 15, 1937, pp. 120-124. Original research. Measurements of the absolute photoelectric yields for distilled surfaces of Mg, Be and Na were made and values of α in Fowler's photoelectric equation determined. For Mg, Be and Na the values of the work function are, respectively, 3.68, 3.92 and 2.29 e.v. and of α, 3.2.25 and 180 $\times 10^{-34}$ cm.^{2} sec./quant. These values of α range from 10^{-2} to 10^{-3} of the maximum theoretical values. The ratios are interpreted as the fraction of light absorbed by the electrons in the surface potential barrier. WAT (14a)

The Photoelectric Work Functions of the 211 and 310 Planes of Tungsten. C. E. MENDENHALL & CHARLES F. DEVOE (Univ. Wisconsin) *Phys. Rev.*, Vol. 51, Mar. 1, 1937, pp. 346-349. Original research. The work functions of a (211) and a (310) plane on one W crystal were determined using Fowler's method. Because the time necessary to outgas thoroughly the crystal would have been very great, the photocurrent characteristics of the clean surfaces were determined from data obtained soon after the crystal was flashed at about 2200° C. The work function of the (211) plane was found to be 4.50 e.v. and that for the (310) plane to be 4.35 e.v. WAT (14a)

The Use of Aluminum for Lightning-rod Conduits (Die Verwendung des Aluminiums für Blitzableiterableitungen) B. Walter. *Z. tech. Physik,* Vol. 17, Jan. 1936, pp. 17-19. Practical. The author develops a formula for the computation of the cross-sectional area of lightning-rod conduits of Al. According to it this area is 2 times that of Cu lightning-rod conduits.
ORS (14a)

Locomotive Piping and Pipe Fittings. P. L. Falconer. *J. Inst. Locomotive Engrs.,* Vol. 26, July-Aug. 1936, pp. 438-509. Includes discussion. The design of locomotive pipes and fittings is discussed, and a full description given of their workshop manipulation. Bending, brazing, annealing, testing and welding are considered, and the characteristics of ferrous and non-ferrous materials used in their construction discussed. JCC (14a)

Some Recent Applications of Aluminum in Railway Rolling Stock. K. Sutter. *L'Allègement Transports,* Vol. 8, Mar.-Apr. 1937, 8 pp. Illustrated survey, covering new aluminized rolling stock in Australia, Norway and Denmark, and the calculation of stresses of the composite structure. HR (14a)

Construction and Treatment of Canoes of Aluminum Alloy (La Construction et l'Entretien des Canoes en Alliage d'Aluminium) *Rev. Aluminium,* Vol. 14, Apr. 1937, 3 pp. Illustrated description. HR (14a)

Preventing the Failure of Boiler Fusible Plugs. E. I. Lloyd. *Steam Engr.,* Vol. 6, Mar. 1937, pp. 229-230. Practical. Sn oxidation forms a network of SnO which prevents flow of molten Sn; 0.3% Zn facilitates such oxidation. Zn may be absorbed from the bronze casing. More than 1% Cu similarly absorbed raises the melting point of the Sn. Bores of plugs should be tinned followed by pouring at a low temperature. Infusible oxide crusts often form on the fire side of the plug. To do so, Sn must have been molten for some time and held in place by ash crust. Plugs also corrode on the water side. For safety they should be replaced at each inspection. AHE (14a)

Aluminum Outfit in a Cast Iron Foundry (L'Outillage en Aluminium dans une Fonderie de Fonte) J. Bally (Staff) *Rev. Aluminium,* Vol. 14, May 1937, pp. 719-722. Illustrated description. Reduction of weight of the molding boxes, which are cast of 90-10 Al-Cu alloy, and fitted with a hinge at one corner, was achieved. 5000 pattern plates, each weighing 10-12 kg. in Al alloy instead of 25-30 kg. in Zn, are used. HR (14a)

Glass and Aluminum (Verre et Aluminium) J. Bally (Staff) *Rev. Aluminium,* Vol. 14, Apr. 1937, 6 pp. Illustrated survey. Process of metallization by spraying with molten aluminum is discussed. Describes different types of reflective pavement stones of aluminized glass, and fabrication of spongy glass by the addition of small percentages of powdered metal to the molten bath.
HR (14a)

Light Metals in Automobile Construction (Leichtmetall im Fahrzeugbau) *Automobiltech. Z.,* Vol. 40, June 25, 1937, pp. 310-311. Advantages now recognized for certain parts and particular points to be observed in order to utilize the mechanical properties to the fullest extent are discussed briefly and illustrated by examples. Ha (14a)

Zamak Alloys (Zamak-Legierungen) *Automobiltech. Z.,* Vol. 40, June 25, 1937, pp. 321-323. Descriptive review. Instead of Sn-containing Zn alloys, fine-grained Cu-Al-Zn alloys particularly suitable for die-casting are used; they contain 3.9-4.3% Al, 0.9-2.9% Cu, 0.003-0.06% Mg, the remainder Zn. Die-castings have a sp. gr. of 6.64-6.7, solidification point 385-390° C., shrinkage 1.1-1.2%, sp. heat 0.098-0.105 cal./g. ° C., expansion coefficient of 0.000027, heat conductivity 0.25-0.27 cal./sec. cm. ° C., electric conductivity at 25° C. 14.44-15.53 m./ohm mm.^{2}, tensile strength 30,000-35,000 lbs./in.^{2}, Brinell hardness 90-100. Aging has practically no effect on the mechanical properties. Molding and casting are similar to bronze; sand- and chill-mold casting can be applied. The alloys can be polished to produce a Ni-like lustre, and Cr and Ni deposits can be made successfully on them. The chromate process gives an excellent corrosion-resistant coating. The material is used extensively for fittings and fixtures on automobiles. Ha (14a)

Tantalum and Columbium—A Review of the Present Status of Two Metals of Growing Importance. *Chem. Eng. Mining Rev.,* Vol. 29, June 8, 1937, pp. 341-343. Ta and Cb occur in a series of oxide minerals, chief of which are tantalite-FeO.Ta_2O_5 containing 86% Ta_2O_5, and columbite-Fe.Cb_2O_5, containing 82% Cb_2O_5. Production and uses of these metals are outlined.
WHB (14a)

14b. Ferrous

M. GENSAMER, SECTION EDITOR

Alloy and Fine-grained Steels for Locomotive Coupling Rods. Hugh O'Neill (London, Midland & Scottish Railway Co.) *J. Iron Steel Inst., London,* Advance Copy No. 11, Apr. 1937, 22 pp.; *Iron & Steel Ind.,* Vol. 10, May 5, 1937, pp. 422-427; *Iron & Coal Trades Rev.,* Vol. 134, Apr. 30, 1937, pp. 788-794; May 14, 1937, pp. 886-887; *Engineering,* Vol. 143, May 14, 1937, p. 560; May 21, 1937, pp. 591-593. Report of tests. Mechanical properties of Ni-Cr-Mo and Mn-Mo steels that have given good service as locomotive coupling rods are reviewed, and certain unusual features observed in the latter are discussed. Banding and low impact values are 2 such features. Both result possibly from local heterogeneity caused by some portions of the steel undergoing the A_1 transformation during tempering. Mn-Mo steels of controlled inherent grain size have furnished uniformly satisfactory results. Data are given on plain C steels of fine grain size that yield practically the same mechanical properties as low-alloy steels and give satisfactory performance, both in manufacture and in service. Laboratory investigations of forgings of coarse and fine grained C steels are described. The McQuaid-Ehn carburizing test is compared with other methods for determining inherent grain size. The McQuaid-Ehn test was satisfactory for differentiating the 2 steels in question, but a method involving a range of temperatures would have been better. A temperature-gradient Cl-etching test was developed that is rapid. Carburizing, decarburizing, flame-cutting, machining, and cold-working properties did not differ for steels of different grain size. Very high processing temperatures, that produce coarse grains in any steel, should be avoided in fabricating. 26 references.
JLG + CMS + Ha + LFM (14b)

Current Transformers for Metering. A. Hobson. *Electrical Rev.,* Vol. 120, May 21, 1937, pp. 760-761. By substituting Ni-Fe for Si-Fe for cores of current transformers much greater accuracy has been obtained in electric metering. Below 5,000 lines/cm.^{2} the magnetizing-current curve of Ni-Fe is much lower that that of Si-Fe, and the phase-angle error is correspondingly smaller. Above 5,000 B, Ni-Fe curve begins rapidly to approach the other, and past 8,000 B, Si-Fe has better performance. For this reason the latter is still used for power transformers. Phase-angle curve of Ni-Fe is much flatter than that of Si-Fe. Use of Ni-Fe permits simplification of design and great reduction in size of transformers.
MS (14b)

One Hundred Sixty Houses of Steel. Wm. H. Lenz. *Eng. Expt. Sta. News, Ohio State Univ.,* Vol. 9, Apr. 1937, pp. 19-20. Reasons for using steel as building material for homes, mainly availability of the raw material, economical production, and versatility of application, are discussed in general and some data from actual experience given. Ha (14b)

Report of a British Strip Steel Mill on Cast Nickel Steel Rolls (Bericht eines englischen Bandstahlzwerkes über Nickelhartguss) *Nickel Berichte,* Vol. 6, Oct. 1936, pp. 149-151. A summary of Communication B 22 of the Bureau of Information on Nickel, London, showing the advantageous employment of Ni-alloyed cast steel rolls for hot rolling the last 2 passes of high alloy steel strip. The Shore hardness can be raised to 95-100 by proper heat treatment. Due to the ensuing brittleness, 79-83 Shore hardness is the current goal. The wear resistance is materially increased by the cold-hardening during rolling. EF (14b)

Research in Steel Brings Long Life to Heavy Tools. *Steel,* Vol. 100, Apr. 26, 1937, p. 58. Moil points for breaking concrete with air-hammers, made of shock-proof alloy steel developed by Jessop Steel Co., stood up under 38-40 hrs. operation before redressing. They gave further service of 22 hrs. before a second redressing. MS (14b)

The Development of Today's Scale Spring. J. W. Rockefeller, Jr. *Wire & Wire Prod.,* Vol. 12, Sept. 1937, pp. 475-477. General survey of materials and manufacturing processes.
Ha (14b)

Present Trends in Alloy Steels. Jean Galibourg. *Metal Treatment,* Vol. 3, Summer 1937, pp. 67-69, 74. JCC (14b)

Use of Stainless Steel Equipment Insures Purity of Modern Finishes. *Steel,* Vol. 100, May 31, 1937, p. 64, 82. Nu-Enamel Corp., Cleveland, O., uses direct-fired stainless steel kettle for cooking resins and varnishes, eliminating metallic contamination of products. MS (14b)

Nickel Clad Steel Saves Cargo and Reduces Ice Needs of Fishermen. *Steel,* Vol. 100, May 10, 1937, p. 54. Refrigerated holds of 3 new trawlers are lined with Ni-clad steel. MS (14b)

Molybdenum in Iron and Steel. H. W. GILLETT (Battelle Mem. Inst.) *Can. Chem. Met.,* Vol. 21, May 1937, pp. 185-186, 188, 192. Comprehensive discussion of Mo as an alloying element for ferrous materials, from the standpoint of the user. WHB (14b)

The Qualities, Characteristics and Uses of Steels. A. C. HARRIS. *Trans. Manchester Assoc. Engrs.,* Session 1935-1936, pp. 133-174. With discussion. See *Metals and Alloys,* Vol. 7, May 1936, p. MA 266L/2. Ha (14b)

Knockdown Scaffolding, Made of Gas Welded Steel Pipe, Gains in Use. W. G. GUDE (Staff), *Steel,* Vol. 100, June 21, 1937, pp. 46, 72. Describes Safway Steel Scaffold. MS (14b)

Special Operations Feature Manufacture of Corrugated Metal Tubs for Washers. FRED B. JACOBS. *Steel,* Vol. 100, May 27, 1937, pp. 40-42. Describes fabrication of welded steel tubs for household washing-machines at plant of Horton Mfg. Co., Fort Wayne, Ind. MS (14b)

The Production of Ingot Mould Castings. R. BALLANTINE. *Mech. World Eng. Record,* Vol. 102, July 2, 1937, pp. 1-3, p. 6. Practical. Illustrates and fully describes the manufacture of small and large (33 tons) ingot steel molds. EF (14b)

Pipe Clamps Cast from Malleable Iron. *Steel,* Vol. 101, July 19, 1937, pp. 58, 60. Describes equipment and special fixtures in plant of M. B. Skinner Co., South Bend, Ind., for forming, straightening, and testing malleable Fe clamps, for bending steel clamps, and for drilling, tapping, milling, welding, and sawing. MS (14b)

Porcelain Enamel Earns Prominent Position in Modern Architecture. *Steel,* Vol. 101, July 12, 1937, pp. 62, 64. Porcelain enameled sheet-steel is finding increasing use in modernization of buildings, particularly store fronts. MS (14b)

Meeting the Problems of Steel Home Production. *Steel,* Vol. 101, July 5, 1937, pp. 46-49. Describes method of construction of prefabricated houses manufactured on a production basis by General Houses, Inc., Chicago. Structural members are formed from 12- to 16-gauge Cu-bearing strip steel. MS (14b)

Materials Used in the Construction of Steam Turbines (Der Werkstoffaufwand im Dampfturbinenbau) H. BAER. *Arch. Wärmewirt.,* Vol. 18, July 1937, pp. 181-185. Practical. Most of the materials that Germany must import are used in the condenser tubes or turbine blades (60-80% Cu brass for the tubes; 5% Ni steel, 18-8, and Mo steel for the blades). Substitutes may be used or the design changed so that less foreign materials will be needed. An increase in speed and a decrease in the number of steps saves blade material. A decrease in the tube diameter or elimination of new condensers saves brass. A simple style of turbine saves Fe. JZB (14b)

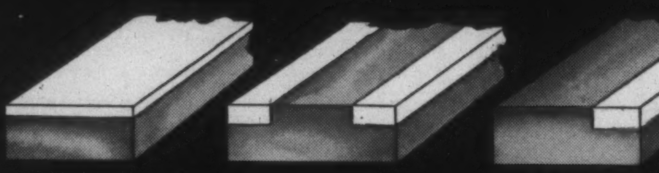
Cast Iron Pipe and Steel Pipe (Gusseisenrohr und Stahlrohr) LEOPOLD HERZKA. *Montan. Rundschau,* Vol. 29, June 16, 1937, (Section *Stahlbau-Technik*) pp. 1-5. Discusses various applications of pipe and gives comparisons of tensile strength, transverse strength, fatigue resistance, porosity, and corrosion resistance for steel pipe and cast Fe pipe, sand cast and centrifugally cast. BHS (14b)

Nickel Clad Steel Plate (Kompoundplåt av nickel pläterat stål) *Tek. Tid.,* Vol. 67, June 19, 1937, pp. 275-276. Nickel clad steel is now in common use in Sweden. Applications include acid proof containers in the chemical industry, autoclaves, vacuum pans, mixers, and storage tanks. Welded pipe is also made of this material. BHS (14b)

The Manufacture of Small Tools. Plant and Methods Employed at the Works of the English Steel Corporation Ltd. Openshaw, Manchester. *Machinery, London,* Vol. 50, June 3, 1937, pp. 277-282. Descriptive. Forging, machining and hardening practices, methods of inspection and machines used for the manufacture of twist drills, reamers, milling cutters, gear cutters and hobs, screwing dies and thread taps. Most tools are 18% W high speed steel. Gear cutting hobs are either 18% W or 22% W high speed steel. The adjustable reamers have 22% W steel blades with Ni-Cr-Mo steel bodies up to 2" diam. and cast steel bodies over 2" diam. JZB (14b)

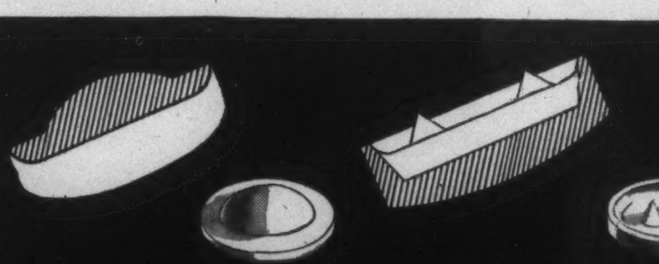
WILCO OFFERS 2 WAYS

of Cutting Silver Contact Costs!



1

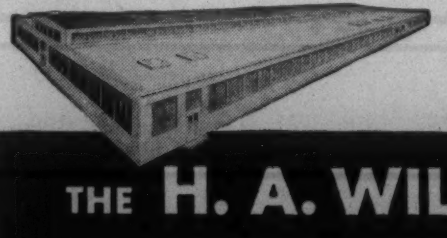
Wilco Inlay and Overlay is available in sheet and strip form or we can furnish stamped parts to your blueprint specifications.



2

Wilco silver steel laminated contacts are made in a variety of diameters—we are equipped to do projection welding for you—send for special bulletin.

● With Wilco laminated contact materials it is possible to reduce the amount of precious metal to a minimum. In addition to actual savings on contact costs, many manufacturers have been able to reduce assembly costs. Here's why. With Wilco Inlay and Overlay materials it is possible to design specially shaped contacts that become an integral part of the contact mechanism—thus reducing parts. Wilco silver steel laminated contacts eliminate riveting because they are permanently welded to their supporting arm. If you will send blueprints and indicate the quantity, we will be glad to furnish a quotation.



THE H. A. WILSON CO.
105 CHESTNUT STREET, NEWARK, N. J.
BRANCH OFFICES · CHICAGO, ILL. · DETROIT, MICH.
Refiners and Workers of Platinum, Gold and Silver · Precious Metal Contacts · Wilco Thermometals (*Thermostatic Bi-metals*)
WILCO

15 · GENERAL

Fundamentals of Safety and Accident Prevention in Steel Plants. L. H. BURNETT (Carnegie-Illinois Steel Corp.) *Am. Iron & Steel Inst.*, Preprint for May 1937 meeting, 18 pp.; *Iron Age*, Vol. 139, June 10, 1937, pp. 40-43, 97; *Blast Furnace Steel Plant*, Vol. 25, June 1937, pp. 646-647. History of the development of the safety movement and its status at the present time. Gives a table of changes in occupational injury rates from 1926 to 1935 for all industries, and suggests a comprehensive safety campaign by the Am. Iron and Steel Inst. along specified lines. VVK + VSP + MS (15)

Economical Operation. H. G. WEAVER (Whitehead Iron & Steel Co.) *Electrical Rev.*, Vol. 120, Apr. 16, 1937, p. 575-576. Discusses electrical operation in steelworks from the economic standpoint and the use that can be made of recording instruments. MS (15)

Gold in the Great Slave Lake Area. MURRAY MCMEEKAN. *Can. Mining J.*, Vol. 58, Apr. 1937, pp. 177-183. WHB (15)

Chewton Goldfield—Success at Wattle Gully Mine Results in Formation of 20 Companies. M. R. MCKEOWN. *Chem. Eng. Mining Rev.*, Vol. 29, Mar. 8, 1937, pp. 229-231. A brief discussion of the history, geology and present position of the prospecting and development in the Chewton gold field. WHB (15)

The Degtyarka Copper Ore Deposits. M. I. MERKULOV & S. N. IVANOV. *Tsvetnye Metal.*, No. 8, Sept. 1935, pp. 18-35. A description of geology of the deposits and estimation of available and probable ores of Zn, Cu and Fe in Russia. BND (15)

Proprietary Purchase. GUY CHADWICK. *J. Am. Soc. Naval Engrs.*, Vol. 49, May 1937, pp. 184-200. The methods of purchase of materials required by the Navy are explained according to original law and superseding or modifying legal interpretations. WB (15)

Preliminary Study of the Blyava Deposits (Russia). G. B. ROGOVER. *Tsvetnye Metal.*, No. 1, Jan. 1936, pp. 18-40. A preliminary report on exploration of copper ore deposits at Blyava in the South Ural. The geology of the region and a detailed description of the ore body are given. The available and probable ore resources are estimated as 18 million tons with Cu content varying from 0.85 to 2.23%, and the total copper content as 324,000 tons. The ores also contain Au; no estimate of Au content is given. BND (15)

Recent Advances in Metallurgy. F. JOHNSTONE TAYLOR. *Indian & Eastern Engr.*, Vol. 78, June 1936, pp. 487-488; Vol. 79, July 1936, pp. 42-44; Aug. 1936, pp. 151-153; Sept. 1936, pp. 264-265; Oct. 1936, pp. 377-378; Nov. 1936, p. 492. Briefly reviews advances made in recent years in the production of alloy irons and steels and in the structure of the various metals. APS (15)

Alloy Steels in Canada. W. R. WERTHER (Algoma Steel Corp.) *Can. Chem. Met.*, Vol. 21, Apr. 1937, pp. 116-119. Review. The growth and development of manufacture is traced for the specific alloy steels available in Canada. The plant of the Algoma Steel Corp. Ltd. is briefly described. The addition of alloying elements, the control of the grain size and the molding of ingots are outlined. WHB (15)

Vanadium-bearing Titaniferous Iron Ores in Singhbhum and Mayurbhanj, India. J. A. DUNN & A. K. DEY (Geological Survey of India) *Trans. Mining Geol. Inst. India*, Vol. 31, Feb. 1937, pp. 117-184. Descriptive and statistical. V-bearing Ti-Fe ores have been found in southern Singhbhum and northern Mayurbhanj with V_2O_5 content varying from 0.6 to 6.0% and very capriciously distributed. A description of the Indian deposits, the uses, occurrences in nature, world's resources and treatment of V and Ti ores, is presented. These ores however contain the highest percentage of V_2O_5 yet known in such magnetic ores. The future value of high grade V-bearing Ti-Fe ores depends upon the determination of a suitable method of extraction of either the V or the Ti or both. APS (15)

Developments at the Crewe Workshops of the L. M. S. Railway. *Machinery, London*, Vol. 50, June 10, 1937, pp. 309-314. Descriptive. Use of dies with stellited chasers in screwing Cu stay bolts increased the production from 7,000 stays to 37,172 stays during the life of the chaser. Reconditioning of axle boxes by melting out the white metal and relining the boxes is described. JZB (15)

Cuts Cost of Handling Forging Flash in Automobile Transmission Plant. *Steel*, Vol. 101, July 12, 1937, pp. 55-56, 58,81. Describes single automatic conveyor system for handling 3 different compositions of steel scrap, originating at various sources in the Chevrolet-Muncie transmission plant of General Motors Corp., Muncie, Ind. The 3 grades of scrap are kept separate. Combination of elevators, hoppers, and a basket conveyor, with lugs on the baskets to permit automatic selectivity of materials, is used. MS (15)

Control Special Pattern Cost. JAMES J. ZIMMERMAN. *Foundry*, Vol. 65, Feb. 1937, pp. 25, 84. Gives some cost control policies adopted at several plants. However they should be added to or revised to meet special conditions existing in any given plant. VSP (15)

Progress in Chemical Equipment in Germany. J. HAUSEN. *Eng. Progress*, Vol. 18, June 1937, pp. 115-122. Review of materials, especially stainless and acid-resisting steels, used in chemical manufacturing processes, and for laboratory utensils and equipment. 36 references. Ha (15)

Metals Progress in Review. *Mech. World & Eng. Record*, Vol. 101, Apr. 23, 1937, pp. 409-414. Apr. 30, 1937, pp. 439-449. Reviews 22 papers presented at the Congr. Intern. Assoc. Testing Materials in London. EF (15)

Metallurgy, Founding and Shaping of Metals (Metallurgie, Fonderie et Faconnage des Métaux) *Usine*, Vol. 46, Special May number, 1937, p. 17. General consideration and observation on the modern development of metallurgical processes. Ha (15)

$364,000,000 for a "Better, Not Bigger" U. S. Steel Corp. *Steel*, Vol. 101, July 19, 1937, pp. 27-30, 38. Describes modernization program of the Corporation since 1928. Greater portion of capital expenditures have centered on new finishing mills. MS (15)

Climax Molybdenum Has New Laboratory in Detroit. *Heat Treating Forging*, Vol. 23, July 1937, pp. 352, 356-357. Describes metallurgical equipment in the laboratory of the Climax Molybdenum Co., Michigan. MS (15)

The Work of the National Physical Laboratory. *Machinery, London*, Vol. 50, June 10, 1937, pp. 317-319. Descriptive review of researches completed and in progress. JZB (15)

An Eighth Isotope of Molybdenum. J. DE GIER & P. ZEEMAN (Univ. Amsterdam) *Proc. Koninkl. Akad. Wetenschappen, Amsterdam*, Vol. 39, No. 3, 1936, pp. 327-329. In English. Original research. The method of the carbonyls, already applied with favorable results to Ni and Fe, was also successful with Mo. A new isotope of mass less than 120 was discovered. EF (15)

Developments in Production Metallurgy of Iron and Steel. GEORGE B. WATERHOUSE (Mass. Inst. Tech.) *Am. Iron & Steel Inst.*, Preprint for May 1937 meeting, 13 pp. *Iron Age*, Vol. 139, May 27, 1937, pp. 43-47, 124; *Blast Furnace Steel Plant*, Vol. 25, June 1937, pp. 609-612. A detailed survey of the metallurgical developments in processing of raw materials, blast furnace design, open-hearth process, refractories, and continuous mills. VVK + VSP + MS (15)

Applications of Unit Heaters. FRED MERISH. *Steel*, Vol. 100, June 28, 1937, pp. 38-40, 70; Vol. 101, July 5, 1937, pp. 64, 66-68, 78. Describes applications in metal-working plants. MS (15)

The Tin Producing Industries. *Metal Ind., London,* Vol. 50, Jan. 15, 1937, pp. 87-94. General. RWB (15)

The British Zinc and Cadmium Industry. L. B. ROBINSON. *Metal Ind., London,* Vol. 50, Jan. 15, 1937, pp. 111-113. General. RWB (15)

Stainless Steels. H. E. BLANK, JR. *Automotive Ind.,* Vol. 77, Sept. 1937, pp. 382-390. Review of the uses, properties and manufacture of stainless steels. CMH (15)

Informality Sometimes an Asset in Production Control. FRANCIS A. WESTBROOK. *Iron Age,* Vol. 140, July 8, 1937, pp. 35-36. Describes a simple and effective system of production control developed by the Heald Machine Co., Worcester, Mass. VSP (15)

Copper Ore Deposits of the Grube Morococha, Peru (Das Kupfererzvorkommen der Grube Morococha, Peru) E. F. TREFZGER. *Metall u. Erz,* Vol. 34, No. 8, 1937, pp. 181-192. Comprehensive survey, chiefly geologic. FPP (15)

Modern Cast Irons in Chemical Engineering. J. G. PEARCE. *Trans. Chem. Eng. Congr.,* (World Power Conf., London, 1936), Vol. 1, pp. 111-121. See *Metals and Alloys,* Vol. 8, July 1937, p. MA 444L/7. AAA (15)

Railroad Tires. W. MELVILLE COX. *Can. Chem. Met.,* Vol. 21, Aug. 1937, pp. 288, 290. Processes of tire manufacture and practices in a Sheffield, England, steel plant are outlined. WHB (15)

The Origin and Composition of Alluvial Gold, with Special Reference to the Morobe Goldfield, New Guinea. M. S. FISHER. *Bull. Inst. Mining Met.,* No. 378, Mar. 1936, pp. 27-31. Discussion. AHE (15)

Climax Molybdenum Has New Laboratory in Detroit. *Iron Age,* Vol. 140, July 1, 1937, pp. 38-39, 66. Describes the new laboratory building and equipment of Climax Molybdenum Co. of Michigan. VSP (15)

Iron and Steel Institute. *Engineer,* Vol. 163, May 7, 1937, pp. 535-536; May 14, 1937, pp. 558-560; May 21, 1937, pp. 589-591. Briefly abstracts and gives discussion of papers read before the Inst., Apr. 1937. LFM (15)

The Royal Society's Conversazione. *Engineer,* Vol. 163, May 7, 1937, p. 533; *Engineering,* Vol. 143, May 14, 1937, pp. 557-559. Brief description of the metallurgical and other exhibits shown at the Conversazione held in London in Apr., 1937. LFM (15)

International Association for Testing Materials Congress. *Engineering,* Vol. 143, Apr. 30, 1937, pp. 497-499; May 21, 1937, pp. 587-589; May 28, 1937, pp. 614-616. Briefly summarizes the papers read before the Association on the progress of metallography, light metals and their alloys, and machinability and wear. LFM (15)

Report of the Activities of the Kaiser Wilhelm Society for the Advancement of Science. General Report (Tätigkeitsbericht der Kaiser-Wilhelm-Gesellschaft zur Förderung der Wissenschaften. Allgemeiner Bericht) *Naturwissenschaften,* Vol. 25, June 11, 1937, pp. 369-383. General report of work done between Oct. 1935 and Mar. 1937. **Report from the Individual Institutes (Berichte aus den einzelnen Instituten)** Ibid., pp. 384-414. Review of papers published and investigations carried out in this period at the various institutes. Of interest are the reports of the Institutes for Research on Metals and for Research on Iron. JZB (15)

Advances in Technical Electrolysis (Fortschritte in der technischen Elektrolyse) HELLMUT FISCHER. *Chem. Fabrik,* Vol. 10, July 7, 1937, pp. 284-292. Comprehensive review of developments in commercial electrolysis in the last few years. The electrometallurgy of Cu, Au, Ag, Ni, Zn, Cd, Pb, Bi, Sn, Mn, Al, Mg, Na, and Be are separately discussed. The electrodeposition of Ni, bronze, Cr, Zn, Cd, Rh, and Al is also reviewed. FPP (15)

Metallurgical Progress in the Years 1934-1936 (Das Metallhüttenwesen in den Jahren 1934 bis 1936) V. TAFEL. *Metall u. Erz,* Vol. 34, No. 9, 1937, pp. 211-219; No. 10, pp. 239-249; No. 13, pp. 340-348; No. 14, pp. 372-381. Unusually comprehensive review of developments in the extraction, reduction and refining of Pt, Au, Ag, Cu, Bi, Pb, Sn, Sb, Zn, Cd, Hg, Ni, Co, Al, and Mg. 471 references. FPP (15)

15a. Economic

Mine Production of Gold, Silver, Copper, Lead, and Zinc in Nevada in 1936—Final Summary Figures. CHARLES WHITE MERRILL & H. M. GAYLORD. *U. S. Bur. Mines, Mineral Market Repts.* No. M. M. S. 595, Sept. 14, 1937, 6 pp. Statistical. AHE (15a)

Secondary Metals in 1936—Advance Summary. J. P. DUNLOP. *U. S. Bur. Mines, Mineral Market Repts.* No. M. M. S. 583, July 21, 1937, 3 pp. Statistical. AHE (15a)

World Production of Gold in Fine Ounces in 1936. *U. S. Bur. Mines, Mineral Market Repts.* No. M. M. S. 598, Oct. 6, 1937, 1 p. Statistical. AHE (15a)

Stainless Steel. T. W. LIPPERT (Staff) *Iron Age,* Vol. 139, May 6, 1937, pp. 36-41, 84. Review of the production of alloy steels during 1936. Corrosion and heat-resisting alloy ingots amounted to about 102,500 tons. Includes a number of useful tables showing production by analyses of corrosion and heat-resisting ingots and castings, 1929-1936, and finished alloy steels, 1935-1936, in the United States; production of plain and alloy steel ingots and castings, 1909-1936; and relative production by processes of total steel ingots and castings, 1921-1936. VSP (15a)

Present Status of Application of Electric Heat in Industry and Crafts (Der heutige Stand der Elektrowärmeanwendung in Industrie und Gewerbe) H. MASUKOWITZ. *Elektrowärme,* Vol. 7, May 1937, pp. 91-100. Comprehensive review of modern application of electrical heating in furnaces and other heating devices. The widest use at present is made in ore-smelting and melting of metals, in heat treating, hardening and joining of metals, drying and varnishing, firing in ceramic industries. Melting of glass electrically is not yet generally applied. Construction details of furnaces for the different purposes are described. Ha (15a)

Mineral Production. E. BALLIOL SCOTT. *Times Trade & Eng.,* Vol. 41, May 1937, p. 10. Reviews production in British Empire during 1936. MS (15a)

Iron and Steel Industry; Planning for the Future. *Times Trade and Eng.,* Vol. 41, Aug. 1937, p. 41. Abstract of report of the Import Duties Advisory Committee on the present position and future development of the British Fe and steel industry. MS (15a)

Utilization of Light Metal Scrap (Verwertung von Leichtmetallabfällen) H. REININGER. *Metallwaren- Ind. Galvano-Tech.,* Vol. 35, Jan. 1, 1937, pp. 32-33; Jan. 15, 1937, pp. 51-52. Collection, dressing and remelting of Al and Mg scrap. EF (15a)

Building of an Aluminum Plant in Holland (De Oprichting van een Aluminium Fabriek in Nederland) W. M. VAN ROSSUM DU CHATTEL. *De Ingenieur,* Vol. 51, Sept. 11, 1936, pp. A300-A302. Conditions and economic possibilities, ore deposits in Dutch colonies, and capital to be invested, are discussed. Ha (15a)

Report of the Mineral Production of Burma for the Year 1935. C. F. GRACIE. *Burma Govt. Pub.* (1936) Statistical. APS (15a)

Mining Deposits in the Eluvium and Alluvium in the Belgian Congo, their Prospecting and Exploiting (Les Gîtes miniers d'Éluvions et d'Alluvions au Congo Belge, leur Prospection et leur Exploitation) E. POLINARD. *Rev. Universelle Mines,* Vol. 13, Mar. 1937, pp. 121-133. Geological conditions and prospecting methods suitable to them are described at length. Mining methods are sometimes still primitive where natives work; equipment is described. Ha (15a)

Outlook for World Consumption of Metals and Fuels. A. B. PARSONS & STUART ST. CLAIR. *Mining and Met.,* Vol. 18, Apr. 1937, pp. 189-196; **Engineers Forecast Long-range in Metals; Steel, 59 to 65 Million Tons, 1954.** IBID. *Steel,* Vol. 100, Feb. 22, 1937, pp. 15-16, 42. An economic review including tables and graphs showing production and consumption of various metals and fuels, 1885-1955. VSP + MS (15a)

Zinc Industry in 1936—Advance Summary. E. W. PEHRSON & H. M. MEYER. *U. S. Bur. Mines, Mineral Market Repts.,* No. M. M. S. 534, Apr. 2, 1937, 3 pp. Statistical. AHE (15a)

Tata's Iron Ore Mines. *Iron & Coal Trades Rev.*, Vol. 134, May 21, 1937, p. 936. Location and types of deposits are surveyed and composition in the different localities in India described. Ha (15a)

Iron-ore Mining in Norway. *Iron & Coal Trades Rev.*, Vol. 134, May 21, 1937, p. 934. The ore deposits in different districts and their compositions are surveyed; the magnetic separation process is extensively used in treating the ores. More than 100 million tons of hematite, with some magnetite, are estimated to exist. Ha (15a)

1936 Steel Ingot and Casting Output in Substantial Gain Over Previous Year. *Steel,* Vol. 100, May 10, 1937, pp. 32-33. Statistical. Official American Iron and Steel Institute figures on production of steel ingots, castings, and rolled products. MS (15a)

The Chemical and Allied Industries in 1936. W. H. LOSEE & H. McLEOD. *Can. Chem. Met.*, Vol. 21, May 1937, pp. 170-177. Economic. WHB (15a)

Steel Markets in Domestic Air Conditioning. ROBERT G. BINGHAM (Staff) *Iron Age*, Vol. 139, June 17, 1937, pp. 40-45, 124. Analyzes home building and public acceptance of air conditioning, and discusses market possibilities for steel products. VSP (15a)

Iron Ore in the British Empire. *Iron & Coal Trades Rev.*, Vol. 134, May 14, 1937, pp. 888-889. Report of the Mineral Resources Dept., Imperial Inst. A total of 17.95 million tons were mined in 1935 which is 12.8% of the world production of 140 million tons. A survey according to continents is given. Ha (15a)

Pig Iron and Ferroalloys Output Was 31,029,187 Tons. *Iron Age,* Vol. 139, Apr. 1, 1937, p. 103. Statistical figures taken from the annual report of the Am. Iron & Steel Inst., 1936. VSP (15a)

A Retrospect. *Engineer,* Vol. 163, Jan. 1, 1937, pp. 17-18. Brief review of the British Fe and steel situation in 1936. LFM (15a)

India's Steel Industry. *Capital, Indian Industries, Trade and Transport Supplement,* Dec. 1936, pp. 49-50. A statistical review. India's output of steel is now approaching 900,000 tons. Domestic consumption is increasing and amounts to 1,078,000 tons. APS (15a)

The Outlook for Zinc. W. R. INGALLS (Am. Bur. Metal Statistics) *Am. Zinc Inst. Preprint,* Apr. 1937. Statistical. During the last 6 yrs. 2,500,000 tons of Zn have been taken out of American mines, more than that contained in new ores developed. A survey at the end of 1930 gave total reserves of 179,000,000 tons of foreign ores, averaging 13% Zn and 7.3% Pb, compared with 180,000,000 tons of ore in the United States, with 5% Zn and 1.25% Pb. Owing to the higher grade of ore the cost of foreign Zn will be less than that of American Zn. Increasing demand makes the outlook optimistic for producers. BHS (15a)

The Distribution of the World's Mineral Wealth. J. A. DUNN. *Trans. Mining Geol. Inst. India,* Vol. 33, May 1937, pp. 61-124. Comprehensive statistical data compilation and survey, with discussion of its strategic significance. Opinion is expressed that the English speaking nations more or less hold the monopoly of strategic minerals and in combination could influence the course of a local or world disturbance of the peace. APS (15a)

Steel Industry Earned 4.4 Per Cent on Invested Capital in 1936. N. E. MACMILLAN (Staff) *Iron Age,* Vol. 139, Apr. 22, 1937, p. 50 + insert. Analysis of production and earnings of the country's 22 leading steel companies. Their combined ingot capacity amounted to 63,282,058 tons and net earnings of $137,552,175, averaging $2.17/ton of ingot capacity. Includes a table giving a financial analysis for 1936 resulting from operations of 22 producers having 91.4% of country's annual ingot capacity. VSP (15a)

Pig Iron and Steel Duties. *Engineer,* Vol. 163, Mar. 5, 1937, p. 276. Quotes from the recommendations of the British Import Duties Advisory Committee as to the exempting from duty of pig Fe and the removal of the additional duty placed on consignments of Fe and steel products imported with a certificate of origin and quota certificate. See also editorial commenting on this in *Engineer,* Mar. 5, 1937, p. 279. LFM (15a)

Scientific Research and Modern Industry (La Recherche Scientifique et l'Industrie Moderne) A. PORTEVIN. *Usine,* Vol. 46, Mar. 18, 1937, pp. 25-27. The interrelation and necessity of cooperation between research and practical application is discussed. Ha (15a)

Rolled Zinc in 1936—Advance Summary. E. W. PEHRSON & H. M. MEYER. *U. S. Bur. Mines, Mineral Market Repts.,* No. M. M. S. 533, Apr. 1, 1937, 2 pp. Statistical. AHE (15a)

15b. Historical

The Production of Fused Plate. SYDNEY W. TURNER (T. Bradbury Smelting Co.) *Metal Ind., London,* Vol. 50, Feb. 5, 1937, p. 191. Historical. RWB (15b)

New German Regulations for welded Steam Boilers (Die neuen deutschen Vorschriften für geschweisste Dampfkessel) KARL VIGENER. *Autogenschweisser,* Vol. 10, Feb. 1937, pp. 20-22. In German. *Mech. World Eng. Record,* Vol. 101, Feb. 12, 1937, p. 150. In English. Lecture summarizing recent modifications of welding specifications characterized by a more liberal valuation of properties of welds and less rigid prescriptions on annealing of finished welds. EF (15b)

The Use of Urine in Ancient Technique (Zur Urinverwendung in der früheren Technik) O. VOGEL. *Angew. Chem.,* Vol. 50, Jan. 30, 1937, pp. 120-121. An historical sketch, showing the uses to which urine was put in old practices, particularly for hardening steel, for which urine was considered more effective than water. It was also used to produce the sull coat for wire drawing. The avesta of the ancient Persians prescribes cow urine for cleaning sacred vessels of Au, Ag, wood, earth and Pb. Ha (15b)

Evolution of Steam Boilers. R. N. APPLEBY MILLER. *Edgar Allen News,* Vol. 15, May 1937, pp. 19-21; June 1937, pp. 32-35. Historical development, from stone, wood and other materials, to steel. Ha (15b)

YOUR HOME
AWAY FROM HOME

HOTEL
ADELPHIA
WHERE THE TRAVELER
MEETS HIS FRIENDS
Every Room with a Bath
at a Most Moderate Tariff
FOUR RESTAURANTS
Floor Show at Supper,
Dinner and Saturday Matinee
NEAREST EVERYTHING
CHESTNUT at 13th ST.
PHILADELPHIA

PROFESSIONAL DIRECTORY

Personal Services Only

1-Inch Card, $2.00 per Insertion ● **2-Inch Card, $4.00 per Insertion**

G. B. HOGABOOM JR.

Testing, Consulting, and Experimental Work
in Electroplating and Finishing of Metals

352 MULBERRY STREET NEWARK, N. J.

CLAUD S. GORDON CO.

Industrial Instrument Repair and Service.

X-RAY TESTING and INSPECTION

1524 South Western Ave. Chicago
314 Ind. Term. Warehouse Bldg. Indianapolis
1988 East 66th St. Cleveland

NEW YORK TESTING LABORATORIES

METALLURGISTS Chemical, Physical, Mechanical and Electrical Tests on all materials.

Photomicrography, Spectrographic Analyses, X-Ray and Radiography.

76-80 Washington St., New York, N. Y.

LUCIUS PITKIN, INC.

Chemists—Metallurgists Engineers—Assayers

METALS TESTING

47 FULTON STREET NEW YORK, N. Y.
Branch: at Buffalo Testing Laboratories, Gerrans Bldg., Buffalo, N.Y.

THE TECHNICAL TRANSLATION BUREAU

Quality Translations, Abstracts, Reviews, Surveys

POST OFFICE BOX 7293 PITTSBURGH, PA.

THOMAS W. B. WELSH

Consultation Analyses Research
Spectrographic and Microchemical Analyses
Inclusions and Segregations

114 E. 32nd Street New York, N. Y.

FREE SERVICE DEPARTMENT

Replies to box numbers should be addressed care of METALS AND ALLOYS, *330 West 42nd Street, New York*

CHEMIST with three years of varied chemical and metallurgical experience, chiefly with stainless steels—25—single —excellent academic and industrial references—location immaterial—will consider research, production, business or teaching position. Box MA-57.

WELDING ENGINEER, supervisor, inspector. 10 years experience in welding procedure, shop methods, design, physical metallurgy. Qualification tests and training of apprentices. Available January 1, 1938. Box MA-58.

HELP WANTED—Metallurgist. Graduate, with experience to conduct laboratory and shop studies of ferrous and non-ferrous alloys and heat treating processes in large manufacturing plant located in Chicago area. Give full particulars including age, education, experience, technical publications, salary expected, and small snapshot. Box MA-59.

ANALYTICAL SPECTROSCOPIST with experience in physical metallurgy. Desires permanent industrial position that allows most of time in either or both of these fields. Ph.D. (1931) in physical chemistry. Minor in physics. Interested in research work. Ability to cooperate. Publications. Married. Box MA-60.

POSITION WANTED: Metallurgist desires change in location. Ten years professional experience in testing, development and research, in U. S. Government Laboratory. Box MA-61.

METALLURGICAL CHEMIST desires position with modern steel foundry.Technical graduate, 3 years experience in analytical and metallurgical direction and sand control. Location no object. Now employed with large mid-western electric steel foundry. Box MA-62.

WANTED: Sales representative—a nationally known furnace manufacturer desires the services of a capable sales representative, for a well established line of electric heat treating furnaces. Territories open are the Detroit and Chicago areas. Replies must contain a complete personal and business history, which will be held in absolute confidence. Box MA-63.

POSITION WANTED: Powder metallurgist desires change. Five years industrial experience in compressing and heat treating powder metals and alloys used in "Oilless" bearings, contact points, and permanent magnets. Will consider industrial or research position. Box MA-64.

POSITION WANTED: Young development engineer and patent attorney desires connections with company needing primarily developmental engineer. Can prepare patent applications. Some experience in both fields. Has M.S.E.E. degree and references. Box MA-65.

HELP WANTED: Foundry manager—prominent machinery manufacturing establishment in Switzerland has position open for well experienced man, capable of managing its foundry departments (hand- and machine-forming —metal castings). Perfect knowledge of German language indispensable. State experience, references and salary expected. Photo desired. Box MA-66.

Book Reviews

MAGNESIUM AND ITS ALLOYS

J. L. Haughton and W. E. Prytherch

His Majesty's Stationery Office, London, 1937. Cardboard 6½ x 9¾ in., 100 pages. Price $0.80, from the British Library of Information, 270 Madison Ave., New York.

This interesting little book, coming from the National Physical Laboratory, combines the results of their laboratory investigations on magnesium with other information taken from the literature so as to constitute a monograph on magnesium and its alloys. The book contains a brief description of methods for the production of magnesium, data on surface protection methods, information on melting and casting, plastic deformation, rolling, forging, extrusion and heat treatment. There is a section on the mechanical properties of magnesium alloys at room temperature and at elevated temperatures. This section is particularly interesting for the new information on the magnesium alloys with cerium. The worker in the alloy field will find particularly helpful the collection of equilibrium diagrams of magnesium alloy systems, which closes the book. Accompanying these diagrams is a series of notes giving the authors' critical comments on the information available on each system.

The book is illustrated with a number of photographs of magnesium alloy castings, which are interesting as showing what is now being accomplished in a production way with this useful light metal.—JUNIUS D. EDWARDS.

QUALITATIVE ANALYSIS BY SPOT TESTS

Fritz Feigl

Translated by Janet W. Matthews

Nordemann Publishing Co., Amsterdam and New York, 1937. Cloth, 6½ x 9½ in., 400 pages. Price $7.00.

Although this book is on analytical chemistry, a subject which is not of direct interest to most metallurgists, it is worthy of review in these columns because spot tests happen to be a very useful tool that the metallurgist may use to advantage for quick identification work, or for examination of metallic or metallically derived residues available in only tiny amounts. To the best of our knowledge, this is the first complete work on this subject published in the English language.

About 150 pages are devoted to spot tests for metals. For each metal, only the best spot tests are described; sensitivity of each test and the effect of interfering elements are indicated, and then specific procedures given for a few cases in the presence of certain, most frequently encountered, contaminants. Both the common and rare metals are covered; the reagents suggested are mostly organic and relatively expensive, but the amounts of reagents used in the tests are so small that the actual cost of using them should not be prohibitive. Wherever possible the author has given test procedures employing simple inorganic reagents. The procedures themselves comprise either contact between a drop of reagent and a drop of the test solution; contact between the test solution (or metal surface) and filter paper impregnated with the reagent; or contact between the test solution and a gel containing the reagent.

The book should be of considerable use to metallurgical chemists.—FRED P. PETERS.

GASES AND METALS

C. J. Smithells

John Wiley and Sons, New York, 1937. Cloth, 5¾ x 8¾ in., 218 pages. Price $4.50.

The author is connected with the research staff of the British General Electric Company. His interest in the relations of gases and metals is centered in the adsorption of gas on the surface of metals in connection with vacuum tube construction. The problems of gassy castings are but cursorily mentioned. Indeed, the author disclaims in the preface any attempt to deal with the practical application of the principles discussed to actual metallurgical processes. The subject is more closely defined by the sub-title, "an introduction to the study of gas-metal equilibria."

With this point of view the treatment is naturally that of the physical chemist and that of the student of catalysis rather than of the metallurgist, and formulas appear constantly in the attempt to systematize matters. That the experimental data are often too discordant to leave any certainty as to what formula is the correct one is evident throughout and frankly admitted by the author. The book serves a useful purpose in collecting the results of experiment and the interpretations put upon them in such fashion that the reader will be less prone to take the conclusions of any one experimenter as gospel truth.

The topic is discussed under three main headings, adsorption, diffusion, solution. Since the results obtained are so dependent on the conditions of experiment, fairly detailed descriptions of apparatus and methods used are frequently included.

The qualitative behavior of some gases and some metals is stated, but the account is by no means complete. The discussion of tantalum does not give the reader a clear idea of its behavior toward gases and the taking up of nitrogen by chromium is not even mentioned. One might expect some discussion of the reasons for the composition of nitriding steels, but the reader is left to form his own conclusions from sketchy comments on some of the individual elements. Such omissions are startling, emphasize the academic nature of the book and how far it is from being written from the point of view of practical metallurgy.

Despite the omission of much material on metallurgical topics on which information worth recording is available and which one might fairly expect to be included in a book with this title, the book is useful. The data utilized come largely from sources not readily accessible to many metallurgists, so that their assembly in one place is a convenience.

The index is inadequate. The reviewer was considerably irritated by finding no hint in the index of a statement he wished to re-read and could only locate by a complete second reading of the whole book.—H. W. GILLETT.

EFFECT OF IMPURITIES IN COPPER

S. L. Archbutt and W. E. Prytherch

British Non-Ferrous Metals Research Association, London, 1937. Cloth, 6½ x 10 in., 134 pages. Price 12s. 6d.

Over a period of some 15 years, the National Physical Laboratory has been studying the effect of small amounts of oxygen, hydrogen, sulphur, iron, phosphorus, silicon, bismuth, lead, arsenic, antimony and nickel, in wrought copper. A few combinations of these have also been studied. Practically all of the data have been published in the Journal of the Institute of Metals, but it is convenient to have them collected and summarized in this way.

Since all the studies were carried out in about the same way, the data are all comparable. An edifice of information has been built up without calling on other sources to much extent. A good deal of pertinent information and important references are thus omitted, but evaluation of conflicting data has thus been avoided.

Work of this type in England has been going on under the sponsorship of the British Non-ferrous Metals Research Association since 1920. The patience of the sponsors and the continuity of effort is noteworthy. Association effort of this type in the United States goes on by fits and starts, with financial support of any magnitude really needed, and with relatively little certainty of continuity. British stability and stick-to-it-iveness is well exemplified by the work.

Collection of reliable information on non-ferrous metals into compact form, analogous to the Alloys of Iron Monographs, is none too well provided for throughout the world. The British Non-ferrous Metals Research Association is slowly meeting the need, since this is Research Monograph No. 4. We hope there will be many more in the series, and that other metals may receive attention similar to that being given to copper.—H. W. GILLETT.

PLASTIC DEFORMATION OF METALS. INTERNAL STRESSES IN METALS. *(Spanlose Formung der Metalle. Eigenspannungen in Metallen)*

G. Sachs

Vol. 3, Section 1 of Masing's Handbuch der Metallphysik

Akademische Verlagsgesellschaft, Leipzig, 1937. Paper, 7¼ x 10 in., 236 pages. Price 22 RM.

In this section of Masing's Handbook of Metal Physics, Sachs presents an outline of principles and practice of metal forming. As its title indicates, the book is subdivided into two main parts: the first (Plastic Deformation) contains the following chapters: Fundamental Principles (42 pages), Stamping and Forging (31 pages), Rolling (27 pages), and Drawing (54 pages), while the second (Internal Stresses) contains 51 pages. The contents are distinctly metallurgical, and touch upon the machinery used in forming operations only insofar as is strictly necessary.

In the first part, the opening chapter offers an excellent summary of the present state of our knowledge of the underlying principles. The other chapters may be described as unusually complete in view of the obvious space limitations. Those points (e.g. photoelasticity and its results) on which more information is required than is given in the text, may be investigated by using the bibliography of nearly 600 references appended to the first section, which also includes 148 illustrations.

The second part on Internal Stresses contains 180 references and 38 illustrations, and is closely related to the first part, particularly the chapter on stresses induced by cold working. Other chapters deal with residual stresses resulting from thermal treatment, mechanical and X-ray (rather sketchy) proof of internal stresses, their evaluation, utilization and elimination. One chapter is devoted to defects due to internal strains.

The only comparable book in this field is the author's earlier work, written in 1934, entitled "Praktische Metallkunde, II. Spanlose Formung" (reviewed in *Metals and Alloys*, Vol. 6, May 1935, page MA 182L/1). Further contributions made during the last two years have been taken into account in the new book. Unlike other books written on this general subject, which are either uselessly theoretical or too practical, Sachs' volume strikes a happy medium between the two types, for although it has a leaning toward the theoretical treatment and will therefore be much used by the research metallurgist, it is not too high-brow to appeal to his more practical cousin.

The author has sifted critically the wealth of scattered information, and presents his summary in his characteristically fluent style. His own extensive research (which, incidentally, has not been featured) on this subject eminently qualifies him to write this authoritative book. It has all the earmarks of a handbook, is moderately priced, and can be recommended without any reservation whatever. —ERICH FETZ.

A. S. T. M. METHODS OF CHEMICAL ANALYSIS OF METALS

American Society for Testing Materials, Philadelphia, 1936. Cloth. 6¼ x 9¼ in., 254 pages. Price $2.50.

This volume includes all of the methods of chemical analysis of ferrous and non-ferrous metals issued by the A. S. T. M. Henceforth these will be collected in separate volumes like this one, and will not be published in the regular annual issues of "Tentative Standards" nor in the triennial "Standards" of the Society. All methods of chemical analysis of metals are now classified as "tentative," even though this meant revising the classification of some methods that had been adopted as "standard."

Procedures are given for the analysis of steel, cast iron, openhearth iron, wrought iron; ferroalloys; aluminum and its alloys; copper, brass and bronze; pig lead; lead- and tin-base alloys; silver solders; electrical resistor alloys; nickel; zinc; and spectrochemical methods for the determination of certain minor constituents in high grade pig lead, zinc and zinc alloy die castings.

Metallurgical chemists are already familiar with most of the methods, by virtue of their publication in previous volumes of "Standards" or "Tentative Standards," but one and all will welcome this separate publication of the chemical methods in such convenient form. The difficulty frequently experienced by those unfamiliar with the society's classification system in locating specific methods is absent here, because of the exclusion of extraneous material.

The lucidity of presentation and the usefulness of the procedures themselves are too well known to require further commendation here.—FRED P. PETERS.

HETEROGENEOUS EQUILIBRIA

(Die Heterogenen Gleichgewichte) - **Rudolf Vogel**

Masing's Handbook der Metallphysik, Vol. II

Akademische Verlag, Leipzig, 1937. Cloth, 7¼ x 9¾ in., 737 pages. Price 68 RM.

Metallurgists have hitherto had to use text books on the phase rule and equilibrium diagrams that were written primarily for chemists and in which examples predominate that are taken from chemical systems. This book is written for the metallurgist and the examples are metallurgical, with rare exceptions when no metallurgical system typifies the case under discussion. Nevertheless, the book is a complete treatise.

The names of both Vogel and Masing insure that the contents are authoritative.

The treatment is based on theoretical grounds, in that plane and solid diagrams are shown for general cases, but specific examples, most of which are drawn from metallurgy, sometimes from ceramics or chemistry, are interspersed. A list of binary diagrams for metal pairs, grouped as to types and giving references to original publications in which the diagrams were developed, occupies 24 pages.

Much more than half of the book is given over to ternary and higher systems. 30 pages are devoted to the discussions of selected metallurgical ternary systems and 30 more to the listing of ternaries that have been studied, with references. How to transfer 4 component systems into pseudoternaries is briefly discussed and a list given of 22 quaternary systems about which more or less is known.

The thermodynamic foundations for equilibria are brought out at suitable intervals. The book aims to show the student how to produce and especially how to use, equilibrium diagrams without trying to show or explain all known diagrams in detail. It is scarcely a book for a beginner, nor is it one to be skimmed. Its completeness and the fact that it is designed for the metallurgist make it of particular value.

One would look far for as thorough a treatment of all the equilibria that may occur in complex metallurgical systems.—H. W. GILLETT.

MOLYBDENUM IN CAST IRON

Climax Molybdenum Co., New York, 1937. Loose-leaf, 8¾ x 10¾ in., 41 pages.

The limitations of plain cast iron are first discussed, the effect of Mo by itself is brought out,next the properties of Cr-Mo, Ni-Mo and Cu-Mo are described, the applications of alloy irons containing Mo are discussed, and the whole is topped off by a very complete index. Though the booklet does not call special attention to it, one cupola iron of 3.20% T.C., 2.13% Si, 0.54% Mo, 0.76% Cu seems noteworthy, as it gave 255 Brinell, 65,000 tensile, 4,000 transverse, 0.36" deflection, and was rated as readily machinable, while most other high test irons of anything like comparable properties require carbon so low as to be difficult to obtain consistently in the cupola.

Especially interesting are persulphate-etched sections to show the distribution of Cr carbides in cast iron on addition of Mo, an iron with only 0.60% Cr showing the carbides in appreciable amount.

The booklet is frankly of an advertising nature, but everything set forth in it is supported by test data, including 69 figures. The contents are clearly written and the printing job excellent. It is of the type of hand book which, though put out by a particular interest, is so informative as to carry conviction. Both the maker and the user of high grade cast iron will find the booklet worth while. —H. W. GILLETT.

FATIGUE OF METALS *(La Fatigue des Metaux)*

R. Cazaud and L. Persoz

Dunod, Paris, 1937. Paper, 6½ x 10 in., 190 pages. Price 80 Frs.

The authors summarize present knowledge on fatigue in rather complete fashion. Corroborative data obtained in the laboratories of the French Air Ministry are frequently cited. While American results have not been disregarded, the great bulk of the work cited is European. This may be the book's chief advantage for American readers since it collects data that are not overly accessible in convenient form.

The chapter topics are: historical and general, characteristics of fatigue fractures, mechanism of fatigue, testing and testing machines, fatigue limits of metals and alloys, influence of various factors, fatigue resistance of assemblies, and conclusions.—H. W. GILLETT.

Current News

John Fritz Medal to Dr. Merica

Dr. Paul Dyer Merica, director of research of the International Nickel Co. and vice president of the International Nickel Co. of Canada, has been awarded the 1938 John Fritz Gold Medal, highest of American engineering honors, for "important contributions to the development of alloys for industrial uses", it is announced.

The award is made annually for notable scientific or industrial achievement by a board composed of representatives of the four national engineering societies of civil, mining and metallurgical, mechanical, and electrical engineers. Dr. Merica's extensive research in theoretical and practical metallurgy has increased scientific knowledge in both ferrous and non-ferrous fields, the citation of the board points out. He is a fellow of the American Association for the Advancement of Science, and a member of several American and foreign societies. In 1929 he received the James Douglas Medal.

Among the 33 previous recipients of the John Fritz Medal were Lord Kelvin, Thomas Edison, Guglielmo Marconi, Elihu Thomson, John R. Freeman, John F. Stevens, Elmer A. Sperry, Daniel C. Jackling, Michael I. Pupin, J. J. Carty, J. Waldo Smith, Frank Julian Sprague, William Frederick Durand, and Arthur N. Talbot.

Morehead Medal to H. Sidney Smith

The James Turner Morehead Medal for the year 1936 has been awarded to H. Sidney Smith, consulting engineer, Prest-O-Lite Co., Inc., New York, for his vision, inspirational guidance and aggressive cooperation in the advancement of the acetylene industry. The medal was presented to Mr. Smith during the opening session of the 38th annual convention of the International Acetylene Association held in Birmingham in November. The medal is awarded annually by the I.A.A. to the person or persons who in the judgment of its officers and board of directors have done most to advance the industry or the art of producing or utilizing calcium carbide or its derivatives.

Mr. Smith has also recently been announced as the recipient of the Samuel Wylie Miller Medal awarded by the American Welding Society and thus becomes the first to receive the two outstanding awards of the welding industry. He is a well-known figure in the acetylene industry both in America and abroad. He has served as president of both the British Acetylene Association and the International Acetylene Association, and he has been directly responsible for many important developments in acetylene utilization.

Perkin Medal Awarded to Dr. Tone

Dr. Frank J. Tone, president, Carborundum Co., has been elected to receive the Perkin Medal of the Society of Chemical Industry for 1938. The medal is awarded annually for valuable work in applied chemistry and will be presented this year to Dr. Tone for his work in the development of abrasives and refractories. The selection is made by a committee representing the five chemical societies in the United States.

The medal will be presented on Jan. 7 at a meeting to be held at The Chemists' Club, New York.

New Research Laboratory for Armco

More than 200 scientists from all parts of the country were guests of The American Rolling Mill Co. at the dedication of Armco's colorful new research laboratories in Middletown, Ohio, on Friday, Nov. 5.

"Research is what keeps industry healthily dissatisfied with itself," was the keynote of the dedicatory address by Charles F. Kettering, vice-president in charge of research of General Motors Corp., at the banquet that concluded the day's activities.

George M. Verity, chairman of the board of Armco, told his audience that "from the courage and brains of men who have refused to accept today's products as representative of 'perfection' has come the impetus that has given us the highest standard of living known in the world, and which has provided profitable investment for savings of the nation and work and more abundant opportunities for millions of men."

Charles R. Hook, president of Armco, declared "the real goal of industry is to find new products for old and new uses, so that as industry itself grows, more people will have the jobs and the money to buy these new conveniences. How can we achieve that goal? Research is the key, industry the force that can turn the lock."

Dr. Anson Hayes, Armco's director of research, was toastmaster.

During the afternoon, guests inspected the new laboratories. Research specialists have termed the new laboratories "the most modern in the industrial world." The building is tradition-breaking in design as well as in the combined application of new and old materials.

Dr. Waterhouse Honored

Dr. George B. Waterhouse, professor of metallurgical production at the Massachusetts Institute of Technology, and president of the American Society of Metals, has been awarded the honorary degree of Doctor of Metallurgy by the University of Sheffield, England. The degree was awarded *in absentia* at a recent congregation of the college, and will be forwarded to Dr. Waterhouse, who was unable to be in England to receive the honor bestowed in recognition of distinguished work in iron and steel research.

Chemical Industry Medal Awarded

The Chemical Industry Medal of the Society of Chemical Industry was presented to E. J. Crane, editor of *Chemical Abstracts,* at a joint meeting of the American Section of the Society of Chemical Industry and the American Chemical Society on Nov. 5, with James G. Vail presiding. The medal is awarded annually for valuable application of chemical research to industry and was given this year to Mr. Crane for his work in abstracting technical and scientific writings in all fields of the chemical industry.

Youngstown's Booklet on Steel

A book of unusually instructive photographs, which pictorially tell the story of steel from iron ore mine to finished products, has just been published by The Youngstown Sheet & Tube Co.

Compiled in the style of popular picture-story magazine using action photographs and brief, to-the-point captions, the book contains 115 pages of basic steel information including a total of 135 action photographs taken in the company's mines and mills. The book is entitled "What We Make and How We Make It." The book is handsomely printed in convenient pocket size and bound in a leatherette cover.

● John McC. Latimer has been appointed exclusive representative in the Western Pennsylvania territory by Lukenweld, Inc., designers and builders of welded steel structures, Coatesville, Pa. His headquarters are located in the Koppers Building, Pittsburgh.

● The J. Max Lee Co., 6501 S. Alameda St., Los Angeles, Calif., has been appointed representative of the Ajax Electric Co., Inc., of Philadelphia, covering the West Coast.

Manufacturers' Literature

Practical Corrosion Data

Tabular data on definitely established uses of Monel, nickel and Inconel, to resist the corrosive action or protect the purity of more than 400 different chemical and corrosive products, are given. International Nickel Co., New York. (B 1724)

Estimating Weights of Welding Electrodes

Six pages of tables are given for convenience in determining the approximate weight of various kinds of welding electrodes for various types of welded joints. General Electric Co., Schenectady, N. Y. (B 1725)

Internally Heated Salt Bath Furnace

The new Ajax-Hultgren salt bath furnace, claimed to offer economy of "fuel" and production time, uniformity of product without local overheating, and improved working conditions, is heated by the electrical resistance of the salt itself. Ajax Electric Co., Philadelphia, Pa. (B 1726)

Furnaces for Industry

"American" electric and JUTHE gas furnaces of special as well as standard design are described in a condensed catalog of the American Electric Furnace Co., Boston, Mass. (B 1727)

2550 Deg. Combustion Furnace

Sentry Model "V" single or double tube furnaces, designed primarily for laboratory combustion applications, are economical. flexible and long-lived, according to Bulletin 1016-1. The Sentry Co., Foxboro, Mass. (B 1728)

X-Ray'd Castings

Composition, physical properties and general fields of service of 7 types of X-ray inspected Thermalloy are given, in Bulletin 102. Electro Alloys Co., Elyria, O. (B 1729)

Hardness Testing Machines

Three popular models selected from this company's complete line of "Improved Brinell" testers are described and illustrated. Pyro-Electro Instrument Co., Dearborn, Mich. (B 1730)

Gray Iron Centrifugal Castings

Unusually high internal and surface quality and wide range of obtainable dimensions and surface finishes are claimed for "Centri-Cast" irons, available either as cupola, crucible or electric furnace product. Shenango-Penn Mold Co., Dover, O. (B 1731)

Gasflux Brazing

Bulletin No. 10 of the "Gasfluxer" cites the technique and advantages of Gasflux brazing, in which a low-melting flux is inducted directly into the gas line. Automatic Gasflux Co., Cleveland, O. (B 1732)

2900 Deg. Cement

The advantages and uses of Sonnitep High Temperature Cement-2900, described as suitable for bonding firebrick at 2900 deg. F. are given. George F. Pettinos, Inc., Philadelphia, Pa. (B 1733)

Gas Boosters

Bulletin No. 109 discusses gas-tight and acid-resistant turbo-compressor gas boosters, claimed to combine the advantages of established turbo-compressor engineering with special provisions for preventing leakage, sparks, etc. Spencer Turbine Co., Hartford, Conn. (B 1734)

Vanadium Steel Castings

Composition, properties and typical applications of C-V, Mn-V, Ni-V and other V cast steels, including V nitriding cast steel, claimed to offer high strength without excessive weight or high cost, are given. Vanadium Corporation of America, New York. (B 1735)

High Speed Furnaces

"Equilib" controlled atmosphere furnaces for heat treating high speed steel are described, with furnace specifications and much technical information on combustion and atmosphere control. National Gas Furnace Co., Providence, R. I. (B 1736)

New Hydrogen Annealing Furnace

These new fias-fired blowerless furnaces for bright annealing small parts at a relatively low cost are covered in this folder. Baker & Co., Inc., Newark, N. J. (B 1737)

Temperature Controls for Gas Heating

Several bulletins giving general description, features, installation instructions and prices of a variety of Partlow temperature controls of the throttling type, both calibrated and uncalibrated, are available from the Partlow Corporation, New Hartford, N. Y. (B 1738)

Stiffness Testers

Bulletin No. 11 describes completely the Olsen-Tour-Marshall Stiffness testers, employing cantilever bending under a steady load, for wire, sheet, tubing, etc. Tinius Olsen Testing Machine Co., Philadelphia, Pa. (B 1739)

Steel Furnace Control

"Automatic Control for the Steel Industry" is the title of this descriptive bulletin, which stresses the production of better and more steel at lower cost through the application of the Jet-Pipe principle to furnace pressure, combustion and fuel-flow control. Askania Regulator Co., Chicago, Ill. (B 1740)

Heavy Duty Refractories

Interesting booklet discusses the nature, manufacture, properties and specific applications in high temperature service of Alundum and Crystolon refractory bricks, lining, and special shapes and Alundum, Crystolon and magnesia high temperature cements. Norton Company, Worcester, Mass. (B 1741)

New Proportioning Indicating Controller

Where continuously variable fuel input is required to maintain constant temperature accurately, proportioning control is described as the only solution, for it proportions fuel input to demand and controls and indicates temperature. Wheelco Instruments Co., Chicago, Ill. (B 1742)

Manganese Steel Uses

The October 1937 issue of "The Amsco Bulletin" is replete with illustrated descriptions of large and small industrial applications of Amsco Steels and Alloys for heat, corrosion and wear resistance. American Manganese Steel Division, Chicago Heights, Ill. (B 1743)

Electric Rivet Heaters

ACF Berwick rivet heaters heat the rivets by passing current directly through them, a process described as rapid, economical, clean and comfortable. American Car and Foundry Co., New York, N. Y. (B 1744)

Machining Aluminum

This 32-page booklet offers a complete, practical discussion of machining practice, both on general and on automatic screw machines, for aluminum and its alloys. Types of tools, tool materials, angles, feeds, speeds, lubricants, coolants, etc., are covered. Aluminum Co. of America, Pittsburgh, Pa. (B 1745)

Ampco Metal

Engineering data sheet No. 46 discusses Ampco Metal forgings. Improvement of impact resistance, applications of Ampco forgings to hydraulic equipment, and forging practice are covered. Ampco Metal, Inc., Milwaukee, Wis. (B 1746)

Alnico Magnets

15-page booklet gives the history, method of manufacture and magnetic properties of Alnico permanent magnets, together with a clear, not too technical exposition on magnetic theory and design. Taylor-Wharton Iron & Steel Co., High Bridge, N. J. (B 1747)

Electric Scale-Free Hardening Furnaces

Bulletin GEA-2790 completely describes GE conveyor-type protective atmosphere furnaces, claimed to assure precise heat treatment, eliminate scale, reduce costs and improve working conditions. General Electric Co., Schenectady, N. Y. (B 1748)

Stainless Steels

The use of special manufacturing processes, with closer metallurgical control than has been heretofore obtainable, has resulted in an unusually high-quality line of stainless, according to this bulletin of Rustless Iron and Steel Corp., Baltimore, Md. (B 1749)

MANUFACTURERS' LITERATURE

Heat Treatment Furnaces

Typical furnaces for a variety of heating and heat treatment operations on solid metals are illustrated and briefly described in an attractive brochure. Slab heating, annealing, patenting, forge heating, carburizing, hardening and malleableizing furnaces are covered. Surface Combustion Corp., Toledo, O. (B 1750)

Controlled Atmospheres for Copper

Technical Booklet No. 112 is a reprint of an interesting article on this subject by W. A. Darrah. Many useful technical data are included. Continental Industrial Engineers, Inc., Chicago, Ill. (B 1751)

Electronic Pyrometer Controller

The "Alnor" pyrometer controller provides automatic temperature control of heat-treating furnaces, melting pots, and other heating devices at a definite predetermined point. Instrument operates electronically. Illinois Testing Laboratories, Inc., Chicago, Ill. (B 1752)

Foundry Sand Testing Equipment

Catalog No. 103 gives specifications and description of this company's complete line of foundry sand testing and control equipment. Harry W Dietert Co., Detroit, Mich. (B 1753)

New Portable Brinell Tester

New Portable Brinell machine, using standard load and ball, is a flexible unit claimed to give results comparable in accuracy with equipment of conventional size. Metlab Co., Philadelphia, Pa. (B 1754)

Acid-Proof Cements

Bulletin No. A P. 122-R is devoted to three acid-proof cements: gray, for resistance to hot or cold acid gases; black, for hot or cold acid solutions; and quick-setting black, for hot or cold acid solutions, where speedy setting is a requisite. Quigley Company, Inc., New York. (B 1755)

Super Refractories

24-page booklet contains a wealth of information about P. B. Sillimanite: mining and treatment, composition, and crystal forms of the raw material; firing, structure and physical and chemical properties of the finished refractories; types and conditions of applications. Chas. Taylor Sons Co., Cincinnati, O. (B 1756)

Portable Hardness Tester

The "Telebrineller" is described as a simple, rugged, flexible instrument that accurately determines Brinell hardness of surfaces and objects inaccessible to conventional testers. Total weight, 6½ lbs. Teleweld, Inc., Chicago, Ill. (B 1757)

Potentiometer Pyrometers

New Bulletin (No. 493) features the Pyromaster—recently developed potentiometer with simplified operating mechanism—and also discusses the new wide strip recorders and controllers. The Bristol Company, Waterbury, Conn. (B 1758)

Furnace for Hardening Be-Cu

A new application of Homo furnaces (used ordinarily for tempering steels) is the hardening of beryllium-copper parts described in folder No. F-T625 (4). Leeds & Northrup Co., Philadelphia, Pa. (B 1759)

Properties of High Temperature Steels

Technical Bulletin No. 20 tabulates the analysis, high and low temperature tensile properties, creep strength and stability, oxidation and corrosion resistance, relative price and other characteristics of 12 steels for high temperature service. Timken Steel and Tube Division, Timken Roller Bearing Co., Canton, O. (B 1760)

Electric Melting Pots

Leaflet 11—TE is devoted to electrically heated pots for melting babbitt, solder, tin, lead, type metal, etc., for continuous service up to 1000 deg. F. Harold E. Trent Co., Philadelphia, Pa. (B 1761)

Flame-Cutting of Plates and Billets

The Cig Gas-O-Graph is described as cutting straight lines and shapes more economically, quickly and accurately than other methods. Compressed Industrial Gases, Inc. Chicago, Ill. (B 1762)

"Actual" Temperature Optical Pyrometer

The new PYRO bi-optical pyrometer provides temperature measurements without uncertain correction coefficients by simultaneously measuring "black-body" and "actual" or "color" temperatures of the hot metal. Pyrometer Instrument Co., New York. (B 1763)

Stainless and Heat Resisting Electrodes

Price list and data book containing descriptions of the company's products and analyses of stainless and heat resisting alloys manufactured by other companies. Maurath, Inc., Cleveland, O. (B 1764)

Gas Fired Furnace

The gas fired Lindberg Cyclone furnace for temperatures from 250 deg. F. to 1400 deg. F. is claimed to heat remarkably fast. Lindberg Engineering Co., Chicago, Ill. (B 1765)

Gas Analysis

Bulletin describing the thermal conductivity method of gas analysis is published by Charles Engelhard, Inc., Newark, N. J. (B 1766)

TAM Products

Leaflet descriptive of TAM metallurgical alloys. The Titanium Alloy Mfg. Co., Niagara Falls, N. Y. (B 1767)

Brazing Alloys

The results of both laboratory and actual production data are contained in Bulletin No. 1. Handy & Harman, New York, N. Y. (B 1768)

Dowmetal Data Book

A new edition, containing especially significant accomplishments in the sections Available Forms and Shop Practice has been published by The Dow Chemical Co., Midland, Mich. (B 1769)

Special Atmosphere in the Heat Treatment and Brazing of Metals

A reprint of the above article by C. L. West, Research Engineer, is offered by The Electric Furnace Co., Salem, O. (B 1770)

Duraloy

Chrome-nickel and chrome-iron alloy groups with recommended applications are listed in a pamphlet from Duraloy Company, Pittsburgh, Pa. (B 1771)

The Metal Analyst

Equipment for metallurgical laboratories is described and illustrated in a booklet of Adolph I. Buehler, Chicago, Ill. (B 1772)

Controlled Grain Anodes

Seymour Nickel Anodes are homogeneous in grain structure, according to this bulletin. Available shapes are illustrated and useful data are given. The Seymour Manufacturing Co., Seymour, Conn. (B 1773)

Free Cutting Steel

An attractive booklet records fifteen years research on the machinability of free cutting steels. Jones & Laughlin Steel Corp., Pittsburgh, Pa. (B 1774)

Industrial Heating Equipment

Bulletin No. 3 discusses oven and pot type furnaces, designed for gas or oil burning, and auxiliary equipment such as pyrometers, blowers, burners, and quenching systems furnished by the M. K. Epstein Co., Springfield, Mass. (B 1775)

Potentiometer Pyrometers

New catalog (No. 1102) covers the complete line of Brown potentiometer pyrometers—indicating, recording and controlling, and includes the new Electro-Line controllers and the Brown proportioning control system. The Brown Instrument Co., Philadelphia, Pa. (B 1776)

Stainless Steel Gate Valves

Diagrams and specifications are included in a leaflet devoted to this company's valves which are claimed to be of simple and compact construction. The Cooper Alloy Foundry Co., Elizabeth, N. J. (B 1777)

Purifying Molten Iron

An iron finishing compound used in the pouring ladle for improving the casting is described in a pamphlet of The Maluminum Co., Indianapolis, Ind. (B 1778)

Charger for Small Cupolas

The Tiger Skip-Hoist Cupola charger, claimed to make possible low cost hot metal from small cupolas with better control and easier operation, is described in folder of the Whiting Corporation, Harvey, Ill. (B 1779)

Microscopes and Auxiliary Equipment

Toolmakers' wide field binocular, junior binocular, and shop microscopes, together with Brinell and tube microscopes and optical aids are described and illustrated in catalog D-22 of Bausch & Lomb Optical Co., Rochester, N. Y. (B 1780)

Steel and Its Manufacture

The story of the manufacture of steel products by this company is given pictorially and descriptively in a 115-page handbook entitled "What We Make and How We Make It." Youngstown Sheet & Tube Co., Youngstown, O. (B 1781)

MANUFACTURERS' LITERATURE

Industrial Furnaces

Oil, gas and electric furnaces are described and illustrated in Catalog No. 6 of the Mahr Manufacturing Co., Minneapolis, Minn. (B 1835)

Meehanite Metal

A specification chart of recommended grades for various service requirements has been issued by the Meehanite Metal Corp., Pittsburgh, Pa. (B 1836)

Ferrocarbo

This material, containing both silicon and carbon combined in the form of silicon carbide, acts as a graphitizer or softener when added to cast iron. Carborundum Co., Niagara Falls, N. Y. (B 1837)

Wire Tester

Illustrated leaflet describes an improved type of machine for testing wire. Capacities are 0 to 250 lbs. and 0 to 500 lbs. Henry L. Scott Co., Providence, R. I. (B 1838)

Magnet Steel

"Nipermag"—a permanent magnet alloy —is the subject of an illustrated booklet. Cinaudagraph Corp., Stamford, Conn. (B 1839)

Flame Hardening

New method of surface hardening which heats the metal with oxyacetylene flame almost simultaneously quenching it with water is described by the Air Reduction Sales Co., New York, N. Y. (B 1840)

What Scientists Say of Leitz Ultropak

Bulletin No. 17 describes the personal experience and application to which Ultropak has been placed by scientific workers in various fields. E. Leitz, Inc., New York, N. Y. (B 1841)

Gasifier

A pamphlet on the Stewart gasifier claims that its use reduces fuel costs as much as 75%, produces a true gas of high B.t.u. value and is easier on furnace lining. Chicago Flexible Shaft Co., Chicago, Ill. (B 1842)

Positive Displacement Blowers

Bulletin 22-B12 discusses the structural features of these blowers. Roots-Connersville Blower Corp., Connersville, Ind. (B. 1843)

Dipping Baskets

In addition to the 14 standard designs, this company will manufacture baskets to specifications. C. O. Jelliff Mfg. Corp., Southport, Conn. (B 1844)

Konik

Data on this steel's physical properties, corrosion resistance and working are offered by the Continental Steel Corp., Kokomo, Ind. (B 1845)

Spring Making

A handbook of modern spring engineering for users and designers of springs, containing useful data as well as illustrations, diagrams and engineering tables, has been issued by Barnes-Gibson-Raymond, Detroit, Mich. (B 1846)

Testing Machine

This machine, for tensile, transverse and compression testing (capacity 30,000 lbs.) is the subject of a leaflet of the Detroit Testing Machine Co., Detroit, Mich. (B 1847)

Adachrome

This plastic chrome cement, claimed to hold its component materials in suspension indefinitely, is described in a pamphlet. Botfield Refractories Co., Philadelphia, Pa. (B 1848)

Hy-Speed Case

It is claimed that this case has a sufficiently low melting point so that it can be used from 900 to 1100° F. on high speed tools. A. F. Holden Co., New Haven, Conn. (B 1849)

Steel in Forged Sections

Hardness conversion tables and tensile property tables are included in this catalog which also gives specific effects of alloying elements in steel. Heppenstall Co., Pittsburgh, Pa. (B 1850)

Corrosion and Heat-Resisting Steels

Enduro Types HCN, NC-3 and HC are described in a leaflet containing analyses, physical properties, instructions for working and applications. Republic Steel Corp., Massillon, O. (B 1851)

Career in Arc Welding

Bulletin No. 416 tells of the practical and technical instruction given by the Lincoln Welding School. The Lincoln Electric Co., Cleveland, O. (B 1852)

Hold-Heet Pyrometers

Wall type and Lance type are described and illustrated in Bulletin No. 202. Russell Electric Co., Chicago, Ill. (B 1853)

Heat and Acid Resisting Castings

Bulletin No. 21 lists the most popular analyses of Standard-Alloy together with safe workable loads at different temperatures. The Standard Alloy Co., Cleveland, O. (B 1854)

High Frequency Electric Power Converters

High frequency electric converters for use in conjunction with numerous industrial induction heating applications are described. Lepel High Frequency Laboratories, Inc., New York, N. Y. (B 1855)

Electromet Review

This publication, whose purpose is to bring "News and Views of Alloy Steels and Irons" to the reader, contains interesting items. Electro Metallurgical Co., New York, N. Y. (B 1856)

Air Weight Control

The importance of air weight control, and the advantages of this company's controller, are given in a leaflet of The Foxboro Co., Foxboro, Mass. (B 1857)

Single-Stage Motorblowers

An illustrated catalog devoted to Type FS Motorblower lists many of the applications for which it is fitted. Ingersoll-Rand, New York, N. Y. (B 1858)

Adjustable Orifice and Proportioning Valves

Leaflet describing and illustrating the above is offered by The North American Mfg. Co., Cleveland, O. (B. 1859)

Metal Melting Furnaces

Catalog No. 29 is devoted to the above furnaces made interchangeable for gas or oil fuel. The Campbell-Hausfeld Co., Harrison, O. (B 1860)

Tantalum

Uses, physical properties and tables of working data on the above metal are given in a booklet of the Fansteel Metallurgical Corp., North Chicago, Ill. (B 1861)

Melting Furnaces

The Walker furnace is identical with the cupola except that the metal is melted in a crucible, with decided advantages, according to this leaflet. Crucible Furnace Co., Inc., Charlottesville, Va. (B 1862)

Heat Resisting Alloy Castings

Data on applications are given in a bulletin dealing with installations where strength at high temperatures must be provided. Ohio Steel Foundry Co., Springfield, Ohio. (B 1863)

Ladle Additions

Bar-Flux, a patented barium compound for use in acid or basic steel for ingots or castings, is featured in a booklet. Grades for use with non-ferrous metals. Si-Lux Co., Pittsburgh, Pa. (B 1864)

Control of Furnace Atmosphere

Two bulletins devoted to a description of "Certain Curtain Control of Atmosphere"; and to furnaces for pre-heating and hardening high-speed steel have been issued by C. J. Hayes, Inc., Providence, R. I. (B 1865)

Improved Pot Hardening Furnaces

A leaflet devoted to these furnaces has been issued by the American Gas Furnace Co., Elizabeth, N. J. (B 1866)

Measuring the Flow of Air and Gases

Flow meters for measuring the flow of air and gases of all kinds to obtain control of gas burning operations and carburizing are featured in a leaflet which contains a description and diagrams of these instruments. American Gas Furnace Co., Elizabeth, N. J. (B 1867)

Wear Tester

The Taber Abraser for measuring the wear resistance, adhesion and rub-off qualities of finishes is the subject of a well-illustrated booklet. Taber Instrument Co., North Tonawanda, N. Y. (B 1868)

Blue Book of Thermometals

Complete mechanical, thermal and electrical characteristics for all standard types of Wilco thermometals are included in this book which contains a review of properties and applications of modern thermostatic bimetals. H. A. Wilson Co., Newark, N. J. (B 1869)

MANUFACTURERS' LITERATURE

Silico-Manganese Spring Steel

Extreme care is taken in processing this steel to avoid imperfection, according to the manufacturers. Illustrated. Bethlehem Steel, Bethlehem, Pa. (B 1870)

Beryllium Copper

Data on properties, heat treatment and fabrication of this copper alloy are given in an illustrated leaflet of The Beryllium Corp. of Penna., Reading, Pa. (B 1871)

Air Setting Bond for Firebrick

Wal-Set, for bonding firebrick and other refractory materials, is the subject of an illustrated pamphlet. Wahl Refractory Products Co., Fremont, O. (B 1872)

Lithoform

This non-inflammable liquid makes paint stick to galvanized iron and other metals that shed paint. American Chemical Paint Co., Ambler, Pa. (B 1873)

Low Voltage Generators

Advanced features of design permitting light weight, compact size, more efficient performance and continuous operation are claimed for these generators. Columbia Electric Mfg. Co., Cleveland, O. (B 1874)

3300 Deg. Super Refractory

An illustrated catalog devoted to "Shamva" Mullite contains information regarding its background, characteristics and uses. Mullite Refractories Co., Shelton, Conn. (B 1875)

Hi-Steel

Information concerning chemical composition, physical properties and corrosion resistance of this steel is offered by the Inland Steel Company, Chicago, Ill. (B 1876)

Radium for Industrial Radiography

This article written by R. A. Gezelius and C. W. Briggs, containing interesting and important information on the subject is published in handy booklet form. Radium Chemical Co., Inc., New York, N. Y. (B 1877)

Weld It Well!

This colorful bulletin, No. HW-4, covers the complete line of P&H-Hansen arc welders from 50 to 800-ampere units, as well as welding fixtures and accessories. Generously illustrated. Harnischfeger Corp., Milwaukee, Wis. (B 1878)

Microscopes and Accessories

General information is given, and various equipments are illustrated and described in the Zeiss catalog. Carl Zeiss, Inc., New York, N. Y. (B 1879)

Refractory

Thermal Alumina which can be used for working temperatures up to 1950 deg. C. and is suitable for the fusion of metals, alloys and alkalies while having a slow rate of reaction with concentrated alkaline solutions, fused salts or boiling concentrated sulphuric acid, according to the manufacturer, is the subject of an illustrated leaflet of The Thermal Syndicate, Ltd., New York, N. Y. (B 1880)

Testing Machines

The Southwark-Emery line of testing equipment is featured in a fully illustrated bulletin, containing charts, curves and technical data. Baldwin-Southwark Corp., Philadelphia, Pa. (B 1881)

Beryllium-Copper

This heat-treatable alloy is corrosion-resistant, non-rusting, non-sparking and non-magnetic and possesses excellent electrical, tensile and fatigue properties. Composition, properties and applications are given in this catalog. Riverside Metal Co., Riverside, N. J. (B 1882)

Non-Ferrous Ingots

Ajax 7 point ingots have 7 outstanding advantages, according to this bulletin, which gives the A. S. T. M. specifications and examples of uses of bronzes, brasses and high lead alloys. Ajax Metal Co., Philadelphia, Pa. (B 1883)

Economical Cleaning of Castings

Whiting roller-bearing tumbling mills provide quick, low-cost, dust-free cleaning of castings, according to catalog No. 217, which also gives detailed description of equipment and drives. Whiting Corporation, Harvey, Ill. (B 1884)

Comparison Microscope

With the Busch comparison microscope the observer sees through a single eyepiece the magnified images of specimen and standard side by side without any separation. George Scherr Co., Inc., New York. (B 1885)

Checker Brick

Technical data and uses of Superior open hearth checker brick, which is claimed to produce a solid stable checker volume, absolutely straight flues and fuel economy through interlocking construction, are given. William M. Bailey Co., Pittsburgh, Pa. (B 1886)

Hot Galvanizing

"A Guide to Longer Life for Iron and Steel Products" is the title of this interesting pamphlet giving the history, applications and advantages of hot galvanizing. American Hot Dip Galvanizers Assoc. Inc., Pittsburgh, Pa. (B 1887)

Temperature and Pressure Instruments

This new 56 page catalog (No. 1060C) gives complete structural, installation and operating data for TAG indicating and recording temperature and pressure instruments. C. J. Tagliabue Mfg. Co., Brooklyn, N. Y. (B 1888)

Ground Shafting

Turned, ground and polished shafting and small diameter drawn, ground and polished bars are discussed in a leaflet illustrating the modern production methods used in manufacturing them. Bliss & Laughlin, Inc., Harvey, Ill. (B 1889)

Retorts for Gas Carburizing

Rotary and stationary retorts are discussed in a leaflet which gives different analyses which may be used for varying conditions. The Calorizing Co., Pittsburgh, Pa. (B 1890)

High Temperature Combustion Furnaces

Single and double tube laboratory furnaces, provided with Globar elements producing temperatures up to 2550 deg. F., are described in a bulletin from the Burrell Technical Supply Co., Pittsburgh, Pa. (B 1891)

Industrial Air Cleaning

Bulletin No. 904 discusses the use of electrostatic precipitators for air cleaning. The Pangborn Corp., Hagerstown, Md. (B 1892)

Surface Hardening by Induction

The TOCCO Process is discussed in an illustrated leaflet of The Ohio Crankshaft Co., Cleveland, O. (B 1893)

Chapmanizing

A pamphlet devoted to Chapmanizing compares it to nitriding and carburizing. The Chapman Valve Mfg. Co., Indian Orchard, Mass. (B 1894)

Electric Furnaces

Catalog No. 23 devoted to the Ajax Wyatt electric furnaces, claims highest possible thermal efficiency and automatic circulation of metal bath among their advantages. Ajax Electric Furnace Corp., Philadelphia, Pa. (B 1895)

Rapid Moore Lectromelt Furnaces

Bulletin No. TC describes patented lift and swing-aside-roof type quick top-charge electric melting and refining furnaces. Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa. (B 1896)

Molybdenum in Steel

Data on different types of molybdenum steels are given in an illustrated booklet of the Climax Molybdenum Co., New York, N. Y. (B 1897)

Ajax-Northrup Induction Furnaces

Bulletin No. 11, superseding Bulletin No. 6, is devoted to the large coreless induction furnaces of the Ajax Electrothermic Corp., Trenton, N. J. (B 1898)

Aluminum

An attractive booklet "Aluminum in Shopfitting and Display" contains a section devoted to practical points on use and fabrication. Arthur Seligman & Co., Inc., New York, N. Y. (B 1899)

Liquitol

Bulletin A1-16-A deals with the use of Liquitol for iron and steel castings and ingots. Alpha-Lux Co., Inc., New York, N. Y. (B 1900)

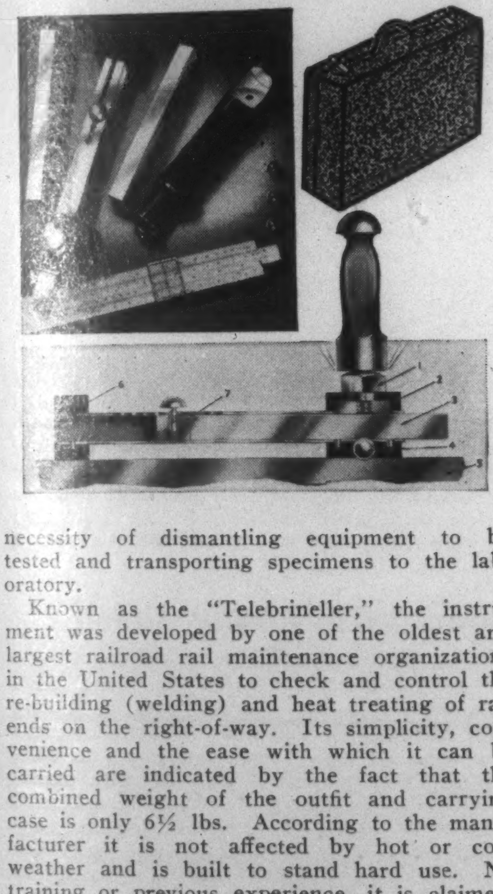
Aerocase

Booklet on this subject. Illustrations, curve charts, tables. American Cyanamid and Chemical Corp., New York, N. Y. (B 1901)

New Equipment and Materials

The Telebrineller—A Portable Brinell

A light-weight, portable Brinell instrument that can be carried easily right to the job is said to simplify metal hardness tests in the field, remote from laboratory facilities and around industrial plants. According to the manufacturers, Teleweld, Inc., Railway Exchange Bldg., Chicago, it can be used in close quarters and can be applied to parts and equipment the size of which have, heretofore, made testing difficult, expensive and sometimes virtually impossible. It eliminates both the necessity of dismantling equipment to be tested and transporting specimens to the laboratory.



Known as the "Telebrineller," the instrument was developed by one of the oldest and largest railroad rail maintenance organizations in the United States to check and control the re-building (welding) and heat treating of rail ends on the right-of-way. Its simplicity, convenience and the ease with which it can be carried are indicated by the fact that the combined weight of the outfit and carrying case is only 6½ lbs. According to the manufacturer it is not affected by hot or cold weather and is built to stand hard use. No training or previous experience, it is claimed, is necessary to operate it accurately.

In addition to its more obvious uses in many types of plants throughout the metallurgic industries, it also has a number of uses in plant maintenance work.

The outfit is composed of the Telebrineller instrument proper, a bar of known hardness, a microscope with a scale etched in its focal plane and a slide rule, packed with extra test bars and impression balls in a small case. The instrument itself consists of a metal tube supported in a soft rubber head and a rubber spacing block, the tube holding the bar of known hardness. An anvil in the top of the rubber head rests directly on the bar. Below the bar an impression ball, secured in a narrow aperture in the base of the head, comes in direct contact with the metal to be tested. The spacing bar holds the bar in a clear area for each test.

To make a test the instrument is held against the specimen and the anvil is struck a sharp blow with a 3 to 5-lb. hammer. The impact is transmitted through the anvil to the bar, then to the ball and on to the specimen. Force of the blow is said not to be a factor, the diameter of the impression in the bar and in the specimen being, in any case, relative to their individual Brinell hardness number (BHN). The diameters of the impressions are then measured in 1/10 millimeters by placing the microscope over each in turn and reading the scale. Figuring the BHN is then a simple matter, using either an arithmetical formula or the slide rule.

Manufacturers are invited to send to the Editor items which are suitable for this department. Illustrations are acceptable, preferably in the form of cuts no more than 2 in. wide.

Solder for Aluminum, Cast Iron, Stainless Steel

A new, specially developed, high tensile strength solder and all-metal flux for low-temperature soldering of such difficult-to-solder metals as aluminum, cast iron, stainless steel, monel and zinc base die castings as well as other metals, has been announced by The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago.

It is stated that while this solder is applied at low temperatures, only slightly above those used for ordinary soft solders, it forms a bond with a tensile strength many times as great, and it can be used for such very difficult production and repair jobs in factories and shops as soldering of cast or sheet aluminum products, joining aluminum and stainless steel, aluminum and copper, etc. It also can be used in foundries for filling in blow holes in aluminum and other castings and can be machined, polished and plated, if desired, it is stated. It is said to withstand temperatures high enough to permit its use in repairing hot water tanks, and valves and pipes on hot water or low pressure steam systems.

The solder is designed for use in connection with the special flux which is furnished in conjunction with it, the flux being used to dissipate the oxides on the surface of the metal preparatory to the application of solder. Blow torch, welding torch or large soldering iron can be used for applying the solder. Solder melts at approximately 500 deg. F.

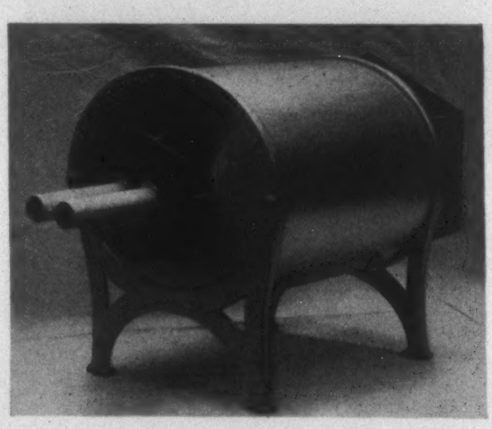
The new product is known as "Imperial All-Metal Solder and Flux" and is sold in kits which contain solder, flux, emery cloth and directions. Kits range in price from $1.75 to $5.00. It also is sold by the pound.

DIRECTIONS
IMPERIAL all-metal Solder and Flux

Dual Tube Combustion Furnace

The original Model "V" high temperature tube combustion furnace which the Sentry Co., Foxboro, Mass., manufactured for over seven years met with such great approval that the company has redesigned this model with increased insulation and other improvements. New tube sizes have been added to considerably extend the line while the features which formerly gave outstanding performance have been retained.

The reputation established by this furnace created a demand for a dual tube furnace, which has been added to the Sentry line. This dual tube furnace is also supplied in several tube sizes. The same type of air-cooled terminals are used that have given many years of trouble-free service, as they do not require periodic attention or replacement. The high operating temperature offered by these furnaces results in quicker and more accurate analysis, especially on stainless steels. These furnaces are efficient and the power consumption is less than for other similar Globar furnaces.



The tubes are gas tight and will withstand the maximum furnace operating temperature and give maximum useful service. The points where the tube passes through the end walls are carefully fitted to prevent unnecessary heat loss. The back end of the tube is twice reduced in diameter, the first restriction being made as it leaves the heating chamber. The second reduction is made to a size convenient for a rubber tube connection. These restrictions increase the furnace efficiency by reducing the heat losses around the tube and assure the end will remain properly cooled without using a longer tube.

Color Pyrometer

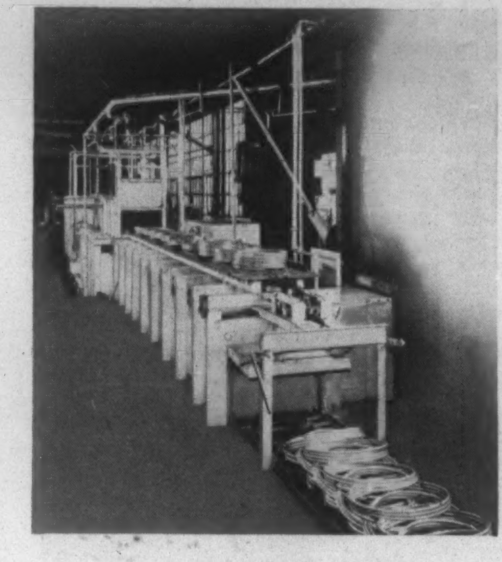
Pyrometer Instrument Co., 103 Lafayette St., New York, has introduced a combined color pyrometer based on the use of light filters and color wedges which are transparent to a number of colors simultaneously. In this pyrometer, the temperature of a black body and the actual temperature may be ascertained simultaneously. The instrument is supplied with scale ranges from 900 to 1900 deg. C. or 1700 to 3500 deg. F. The new instrument may be used for many laboratory and research applications including incandescent iron and iron alloys, etc.

Furnace for Bright Annealing of Copper Tubing

A new type of bright annealing furnace has recently been installed at the plant of the Roberts Tube Works, Detroit, which is described as remarkably economical in operating costs. It can be described as a U-shaped double deck furnace through which the material is carried on alloy trays pushed along by the chain and hook system.

When the material has been placed on the charging platform on the upper deck, the trays are pushed into the first of the four sections of the furnace, a non-heated dead end, into which the specially prepared atmosphere has been introduced under sufficient pressure to create air locks which will prevent infiltration of outside air.

The loaded trays are now pushed forward to the second section, an elevator compartment in which the batch of trays descends to the lower deck by the simple use of an automatically working motor-driven worm arrangement.



From here the trays enter the third section, a heating zone in which an alloy muffle protects the material from direct contact with the products of combustion of the fuel used in the heating process.

The last section is the cooling chamber in which the material is being cooled to about 150 deg. F., a temperature sufficiently low to exclude any possibility of oxidation when the trays finally emerge to the unloading platform.

Throughout the sections of the furnace sufficient quantities of specially prepared atmosphere are being introduced at various points to insure against air infiltrations. This atmosphere is produced in a cracking unit in which natural gas of 1000 Btu is burned with about six times its volume of air. The resulting product is passed through a sulphur scrubber and through a cooling unit in which all moisture is trapped and the atmosphere cooled to about 36 deg. F. Finally it is carried to the furnace sections as described above.

A typical analysis of the atmosphere shows 4½% CO, 7½% CO_2, with the remainder nitrogen, without a trace of free oxygen.

The fuel used in heating the material is also natural gas of 1000 Btu, introduced through automatically controlled burners, with no possibility of free oxygen attacking the nickel alloy muffle.

The cooling chamber is equipped with a motor-driven fan which forces the atmosphere to circulate through water-cooled radiator fin coils with sufficient velocity to effect a cooling to 150 deg. F. within the 30 min. allotted each cycle of the operation.

The capacity of the furnace illustrated is 1 ton per hr., with a fuel consumption of only 1200 cu. ft. of gas. Of course, the unit may be worked with any of the commonly available commercial gases, the relative overall efficiency and economy being the same in all cases.

The entire equipment has been developed by the Bellevue Industrial Furnace Co. of Detroit. Patents covering the various features of design and arrangement are held by P. J. McIntyre, former chief engineer of the Wolverine Tube Co., and for more than 25 yrs. identified with the copper industry. The sole manufacturing rights are retained by the Bellevue Industrial Furnace Co.

Atomic-Hydrogen-Welding Equipment

When considering the manufacture of metal tubing, a large midwestern manufacturing company asked General Electric application engineers for suggestions. The result of the combined efforts of the engineers and the plant management was the introduction of a process in which a General Electric atomic-hydrogen-welding equipment was an essential part. The tubing produced with this equipment is very clean, smooth and free from oxidation.

The atomic-hydrogen-welding process is used to weld the seam of ⅜-in. nickel alloy tubing. After it is cut into 20-ft. lengths and cleaned with a hydro-carbon of low flash point to remove all trace of compounds used in the forming process, the tubing is inserted into a power feeding machine upon which the atomic-hydrogen-welding head is mounted. The tube is moved forward at a constant rate by a set of driven grooved rolls at each side of the welding head, directly under which is an adjustable grooved idling roll. A knife roller in front of the first power roll keeps the seam of the tubing in the proper position. To reduce end losses, the lengths of tubing are joined together just before entering the power rolls.

The welding head, which is adjustable in all directions, contains a fan-shaped electric arc inside of a hydrogen flame. This arrangement of arc and flame is obtained by maintaining a single-phase alternating-current arc between adjustable tungsten electrodes and feeding hydrogen gas to the arc. Molecules of the hydrogen are broken into atoms by the intense heat of the arc and, in recombining outside of the arc, liberate heat far in excess of that obtainable by any gas flame alone. This heat is used to join the sides of the tubing as it passes through the welding head and results in a high welding speed. The welded seam is scarcely noticeable either inside or outside of the tube.

Samples of all tubing welded by this process are rigidly tested by hydraulic pressure and are severely flared and flattened to check the strength of the weld. Scrap from all causes does not exceed 6 per cent and often runs as low as 2 per cent.

Atomic-hydrogen-welding has several features which make it well suited to production welding. Hydrogen, being an active reducing agent, prevents the formation of oxides and hence produces a strong, smooth, ductile weld. Metal welded by this process is not in the electrical circuit and need not be grounded or insulated. Since the atomic flame is constantly maintained, welds made by this process are highly uniform.

Welder Flexibility—Plus

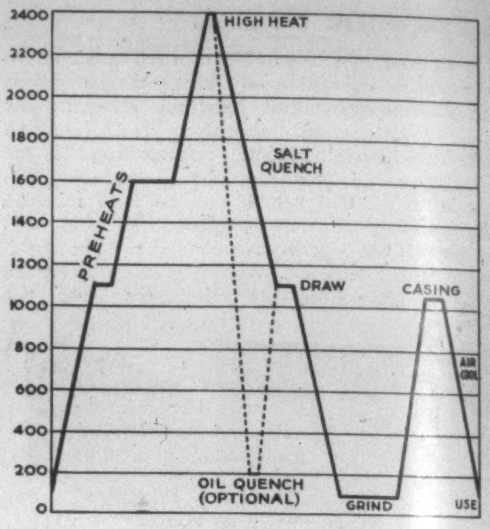
Rosselle's, Inc., one of the leading welding shops in Miami, Florida, reports a shop-built 200-ampere engine-driven welder which is claimed very unusual both from the viewpoint of construction cost, operating characteristics and range of use. The basis of this highly portable machine is a new 200-amp. 1750 r.p.m. P. & H.-Hansen Smootharc Welding Generator, purchased from the Ward Engineering Co. of Jacksonville. This bare generator was mounted upon a home-built frame with pneumatic-tired wire wheels, and connected up with a discarded Ford Model A motor. The entire mounting, including the motor, cost less than $40.

Mr. Rosselle has incorporated in this device something that doubles the value of his gasoline-driven welder—he has connected across the terminals of the welding generator a permanent set of leads which are carried to a regular outlet box, equipped with a standard Edison receptacle mounted on the panel between the engine and the generator. Into this receptacle he plugs a standard electric drill or grinder connection to give him a very efficient source of power when operating this type of tool. The high circuit voltage of the generator is pointed to as ideal for operating grinding or drilling tools, and has enabled Mr. Rosselle to build a portable unit that has already justified its cost from the standpoint of the drilling and grinding operations alone.

New High-Speed Steel Treatment

A comprehensive cycle of high-speed steel treatment is announced by E. F. Houghton & Co., Philadelphia, in a bulletin describing new high-speed steel salts recently perfected by its research staff. Optional treatment, adapted to shop facilities and the number of pots economical to operate, is also set forth. Together with other salt bath products for liquid carburizing, reheating, neutral hardening, tempering, and blackening, the new high-speed steel salts formed an important feature of the liquid bath displays at the National Metal Exposition in Atlantic City.

The cycle of treatment is shown in the diagram, the products used being branded "Liquid Heat." For the preheat, a neutral hardening salt, which will neither carburize nor decarburize, is provided. Liquid Heat No. 2400 with a working range to 2500 deg. F. is recommended as a high-heat salt. Work may be quenched in oil or given a salt-bath quench following the quick high-heat treatment.



After being drawn, the work is ground and a case is superimposed upon it by a further liquid bath, recently perfected, giving an outer case 0.001 in. to 0.002 in. in depth. This additional treatment adds a hardness of more than 1,000 Brinell, and increases production of high-speed tools from 25 to 300 per cent, according to users. The new salts and the high-speed steel treatment are described in a bulletin "Liquid Salt Baths."

Monel With Ebony Finish

Research engineers of the Huntington Works of The International Nickel Co., Inc., have produced "Ebonized" Monel with an ebony finish designed for use where appearance must be maintained under temperatures up to 1400 deg. F. The material is identical with standard Monel except that a lustrous "blue-black" finish is imparted in a specialized oxidizing operation. It has been created particularly for a newly designed heat deflector used in Chromalox super-speed range units manufactured by the Edwin L. Weigand Co.

Element pans, reflectors and deflectors in all electric heating units have been source for complaints because the materials from which they are made invariably suffer heat discoloration or stain and rust. Since this new ebonized metal like standard Monel possesses complete rust immunity and diversified resistance to corrosion in addition to its new ability to resist discoloration from relatively high temperatures, it helps provide insurance against costly replacements and unsightly appearance.

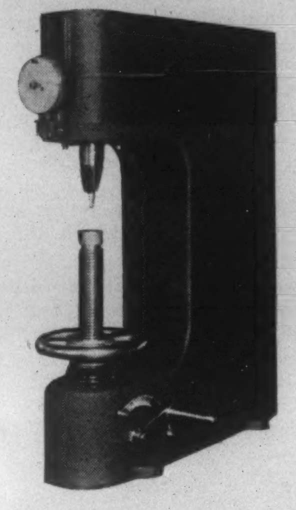
The deflector design is an interesting one. Until now, most heating units were equipped with reflectors—pans of bright materials that tended to reflect heat back up toward the unit. The deflector presumes the operation of a flue. It convects air currents that in turn transmit escaping heat back towards the middle of the element. In this manner the heat is intensified by the up-draft air currents directed by the design of the ebonized Monel deflector.

Tests by thermal experts demonstrate that an improved efficiency is obtained with the unit.

Pyro-Universal Hardness Tester

The Pyro-Electro Instrument Co., 6659 Chase Road, Dearborn, Mich., has developed a direct reading universal hardness testing machine which is calibrated for three balls, 1-16 in; 1-8 in., and 5 mm.; also for a penetrator diamond.

The load is applied by a hand operated crank conveniently located to the right of the operator and just below the elevating screw which eliminates lost motion and operator strain in reaching to the top of machine.



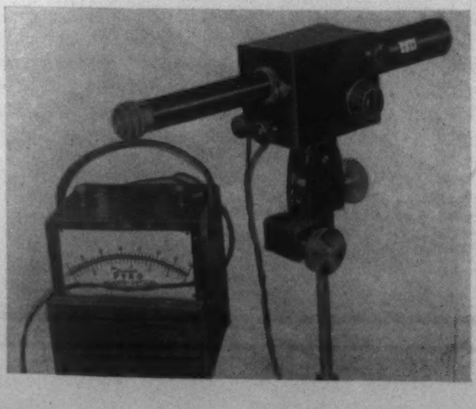
A slight movement of rotating cam applies and releases load smoothly through knee-action mechanism, giving absolute dead weight control. There are no levers, pivots or bearings to set up friction. Temperature changes will not affect operation as there is no oil pot.

The standard machine has a vertical capacity of 8 in.; load capacities of 60 kg; 100 kg, and 150 kg, with no change in minor load. Tests on very thin stock, say at 15 kg or, conversely, at 750 kg, require a special type.

Retaining lugs permit machine to be secured to work table, precluding damage to machine from tilting. An ingenious dial arrangement permits "A," "B" and "C" scale readings with but one dial having only one set of black numerals. The rugged design and construction assures long life and satisfactory service under any working conditions.

Pyro Micro-Optical Pyrometer

The Pyrometer Instrument Co., 103 Lafayette St., New York, has placed on the market a new instrument, the "Pyro Micro-Optical Pyrometer." This is a precision instrument, claimed to be of the highest caliber, and is for use in measuring the temperatures of very small objects such as incandescent lamp filaments, etc., and for laboratory and scientific research work. A 20-fold magnification of the object is provided by means of an optical arrangement of high candle power. To obtain the best results, it is always used and is furnished with a rigid support and tripod, the instrument holder being equipped with a fine precision worm gear arrangement for accurate adjustment in any desired direction so as to focus the instrument steadily on any given spot or the smallest object.



Details of the construction and how it is used can be found in a new catalog No. 90, obtainable from the company.

Vibrometer for Measuring Amplitude of Vibration

The Vibrometer, an instrument for measuring the amplitude of vibration of structural or machine members, is announced by the American Instrument Co., 8040 Georgia Ave., Silver Spring, Md. The range of the instrument is from 0.001 to 0.030 in. amplitude.

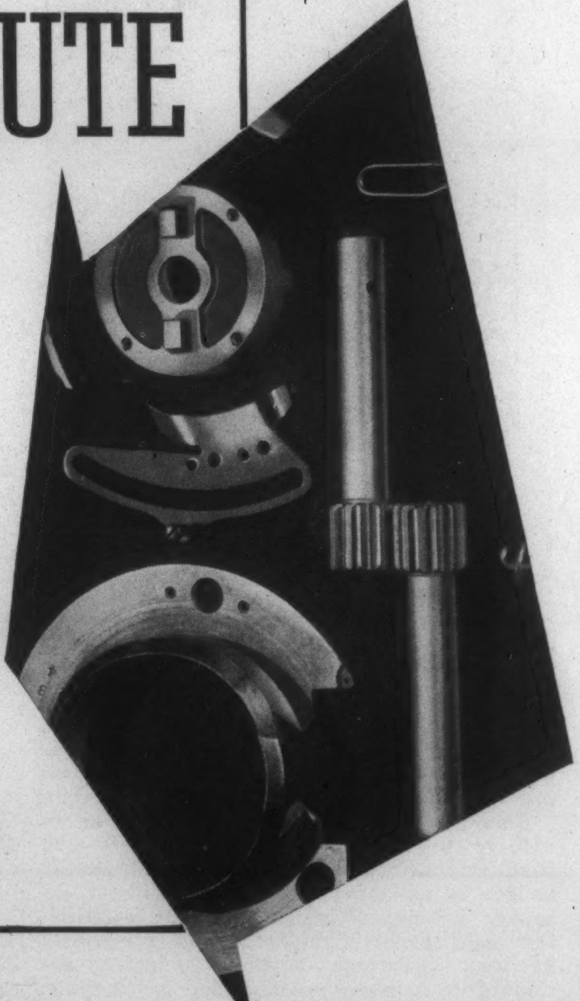
Its use is simple—it is held in the hand and the needle point held against the vibrating part whose amplitude is to be measured. The vibrating motion of the spindle is transmitted directly to the vibrometer pointer (which appears as bright yellow against a black background). The vibrating pointer appears double to the eye of the observer, and the apparent intersection of the two images, read on the scale on the background, gives the amplitude of vibration directly in thousandths of an inch.

The instrument is made heavy (2 lb.) to avoid inertia effects during use, and the construction is such that no damage can result to the instrument when it is applied to a vibrating member the amplitude of which is greater than 0.030 inch.

A Larger Motor Valve Mechanism

The Automatic Temperature Control Co., 34 East Logan St., Philadelphia, Pa., has added a second and much larger unit to its Type 1 line of motor valve mechanisms. This is called Model C. It is mounted to a 4-inch, 150-lb. Saunders patent valve. The mechanism is designed to operate slip stem valves for heavier pressures and in the larger sizes. The mechanism exerts an opening and closing force on the valve stem of 2000 lbs. with 5 in. per min. movement and 2½-in. stroke. Strokes up to 10 in. and speeds of 3 to 10 in. per min. are available, with corresponding changes in power.

An important feature of the Type 1 line is a novel power release feature which positions the valve at definite open and closed points regardless of variable motor drift. This mechanism can be used either for full open and closed operation or for automatic control with incremental movement proportional to some variable such as pressure or temperature.



A NEW ROUTE

TO LOWER COSTS

AND IMPROVED

PRODUCTION

...VIA THE

CHAPMANIZING

PROCESS FOR

SURFACE HARDENING

A short-cut to longer profits and better results in surface-hardening steels has been put on the map by the modern process of Chapmanizing. More and more plants are routing their heat-treating this way.

For in 1/3 the time required for carburizing free-machining steels, Chapmanizing imparts a case that lasts 9 times as long . . . a case *both* tough and ductile . . . that can be subjected to bending, impact, and abrasion without danger of fracture, flaking or chipping. A case of any depth from .002" to .035" . . . resistant to acids and corrosion . . . close-grained and glass-hard, as tests and photo-micrographs show.

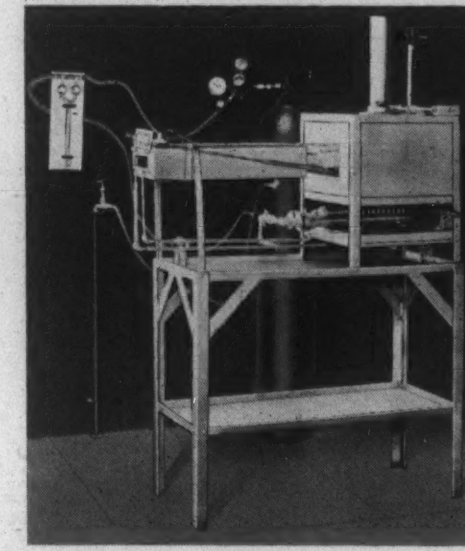
And to gain the advantages of Chapmanizing, no investment is required. Just install the Chapmanizer Unit on contract; hook it up to your present hardening furnaces. Write today for your copy of the new illustrated Chapmanizing book.

The **CHAPMAN VALVE**
MANUFACTURING COMPANY
INDIAN ORCHARD · MASSACHUSETTS

A Hydrogen Annealing Furnace

Because there existed a real need for a low-cost annealing device, using a hydrogen atmosphere, Baker & Co., Inc., Newark, N. J., undertook the design and manufacture of such a furnace. This attempt also was based on the success and popularity of the company's blowerless tool-room furnace. By temperature variation, the annealing can be controlled so that a graduated range of softness is available to the operator.

The basic design is an adaptation of the company's gas-fired tool-room unit with certain modifications. Pre-heated hydrogen or other deoxidizing gases flow into the heating chamber where they reduce the oxide which may occur upon the surfaces of the metal under treatment. Upon completion of the annealing, the tray is pushed into the cooling chamber in the rear. Here, in the same atmosphere, the metal cools below the point where oxidation may recur, when the work is removed from the furnace. The furnace is safe; 1600 deg. F. is reached in 35 min. and 1850 deg. F. in 1h. 15 m.



Two sizes are available: No. 11 has a heating space 6 by 8 in. with a height of 1½ in. No. 12 has a heating space 8½ by 15 in. with a height of 2½ in. Special sizes may be built to order.

Valcase—A Carburizing Salt

Under the trade name "Valcase," the Chapman Valve Mfg. Co., Indian Orchard, Mass., offers a carburizing salt which it describes as a "new method of liquid carburizing for maximum penetration in minimum time."

This new salt, Valcase, is described as an entirely new, fused bath mixture, prepared from carefully selected materials and readily melted in ordinary pot furnaces, without excessive fuming or smoking—a true carburizing bath, perfectly balanced and economical in use. The case depths obtainable are claimed to range from 0.015 in. in 30 mins. to 0.045 in. in 4 hrs.

Valcase is recommended for the carburizing of all parts requiring a uniform deep carbon case with dependable hardness. Emphasis is put on the claim that parts, when withdrawn from the bath without quenching, may be readily machined, then reheated and quenched.

Some of the advantages claimed for Valcase over ordinary salt bath mixtures are: Uniform depth and hardness of case, rapidity of penetration, freedom from corrosion of finished parts, fluidity of the bath at operating temperature, thus reducing drag-out loss, excellent impact and wear resistance values, wide temperature range for treating material (1450 to 1700 deg.), machinability after heating without quench, and gradual merging of case with core.

The work to be treated is placed in the bath for a predetermined time, depending on the temperature of operation and the case depth required, after which it is transferred to a reheating bath operating at suitable quenching temperature to produce proper physical properties for the type of steel being treated. The work may be quenched in oil, water or solution as desired.

Dust Tight Capacitors

A new line of Westinghouse dust tight capacitors has been developed for use in mills and plants with dust laden atmospheres to protect the live parts from an accumulation of foreign materials. These capacitors consist of three component parts, namely: the capacitor unit proper, the dust tight terminal compartment, and the mounting supports.

The capacitor unit is of the Inerteen type in a heavy welded sheet steel case with rugged porcelain terminals mounted into the case by the Westinghouse solder sealed process, whereby a bond is made between the case and the porcelain through the medium of a metalized platinum coating on the porcelain.

The dust tight terminal enclosure is designed to mount on the capacitor unit sealing on a gasket of felt. A felt gasket is also used under the cover which is held down by spring latches. The terminal enclosure contains boric acid fuses and discharge resistors. Two types of mounting supports are available, one for mounting in an angle iron rack structure, and the other for mounting the unit on the floor.

Several of these dust tight capacitors may be placed side by side about 1 in. apart and connected together by means of 1½ in. flexible or rigid conduit, using side knockout holes. Knockouts are also provided in each end of the terminal enclosure for making the final connections to the circuit. The outstanding advantage of this construction is first, that the terminal cover is easily removed from the unit for the purpose of removing the knockouts, and second, should it for any reason be necessary to replace a capacitor unit, this unit can be removed from the terminal enclosure and a new one placed on without disturbing the conduit connections that are made from one unit to the next.

These dust tight units are available in 5 and 7½kva., 230 volt, 60 cycle ratings, and 5, 10 and 15 kva, 460 and 575 volt ratings. They are designed to meet all standard N. E. M. A. and A. I. E. E. tests. They are of the Inerteen type, being impregnated and filled with a fluid which will not support combustion and which will not give off gases which support combustion in any combinations with air.

Carbide Tool Grinder

The Baldor Electric Co., 4357 Duncan Ave., St. Louis, announces the development of a grinder, designed for the one purpose of sharpening carbide tools. This grinder is equipped with two wheels; one for roughing operations and one for finishing operations and is powered with a ½ h. p. reversible motor, so that either right-hand or left-hand tools may be sharpened with the wheel always rotating towards the cutting edge of the tool. The grinder is designed to take a silicon cup wheel on the left-hand side, and either a silicon cup wheel or a diamond cup wheel on the right-hand side.

Standard equipment includes the following: Tool rest tables 10x3½ in.; protractor at each end of grinder to indicate the angle of the tool table; light which may be swung over either wheel; tool supports attached to tool rest table; wheels are optional.

A Chrome Plating Rack Enamel

An enamel for insulating all but the contact points of the racks used in chrome plating has been developed by the Maas and Waldstein Co., makers of industrial finishes, Newark, N. J., and placed on the market after extensive tests in all types of actual plating service.

This "Chrome Rack Enamel" effectively insulates all parts of the rack that it covers, thereby preventing the dissipation of the current. It is applied by dipping the racks (with the contact points protected by tape) into the enamel. Three or four coats are required, which can be applied at intervals of about 2 hrs. After the final application, the coating becomes hard enough for use if forced-dried for 2 hrs. at 150 deg. F., or is air-dried for 24 hrs. This work can be done in any plating shop. This enamel is supplied in two colors—red and black.

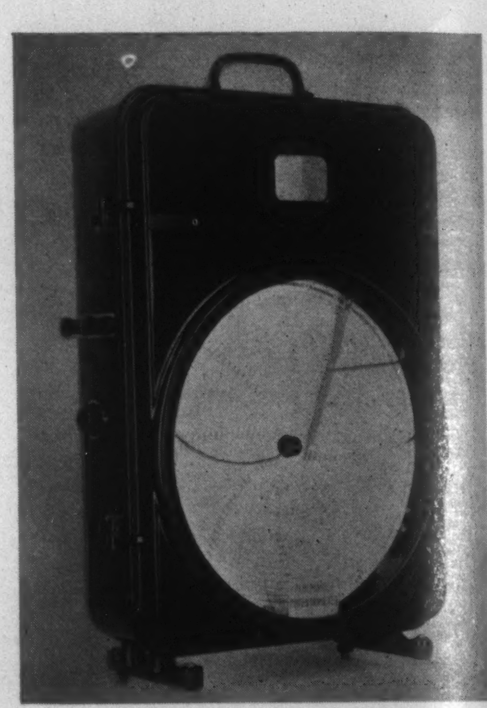
Portable Pyrometer

The instrument shown in the illustration is a new Portable Recording Pyrometer—one of a new line of "Pyromasters" manufactured by The Bristol Co., Waterbury, Conn. The simple operating principle of these instruments and their compactness of construction, give them special features that are especially useful for portable service. In summary these features are as follows:

The instrument is unusually rugged—not affected by vibration—does not require careful leveling while in use. There are no continuously moving parts or trains of gears to become engaged and released to position the pen on the chart—no mechanical motion of any kind, except when a change in temperature occurs at the thermocouple.

When an unbalanced condition in the potentiometer circuit occurs, a series of relay-actuated switches operate a motor to position the slide wire contact to which the pen arm is mechanically connected.

The galvanometer is equipped with a highly damped coil—the galvanometer arm is free to deflect at any time, not being periodically engaged by a clamping device.



The instrument is constructed so that it is composed of five separate replaceable units—there is no mechanical connection between the galvanometer and any of these units, the connection being electrical, only.

Bristol's Portable Pyromasters are available as Pyrometers for ranges from 0 to 500 up to 0 to 3000 deg. F., using standard thermocouples. They are also available as resistance thermometers, for ranges from 20 to 350 deg. F. Provision is made on the case for suitable plugging devices to connect these instruments to the thermocouple or resistance bulb, and to a source of a-c power, 110 to 220 volts. The chart is 12 in. in diameter and rotation is by telechron clock.

Extruded Aluminum Shapes for Booths

An interesting feature of this year's Automobile Show was the "extruded shape" or interlocking method of erecting the booths and decorations, used for the first time in the current show. Two and one-half tons of aluminum were required in the construction of these extruded shapes, which make the old method of hand-built booths obsolete.

This new development in decorative display construction is the work of Russell Hohl of the Revecon Department of the Revere Copper & Brass Inc., who designed the shapes exclusively for the Ivel Corp., of New York City, decorators for the exhibition.

Ease of erection, rigidity of partition and facility in dissembling parts, all of which can be used again, have solved many of the problems formerly confronted in the building of display booths.

"Monofrax" Refractories Developed at Mellon Institute

A new series of super refractories adapted particularly for us in high temperature furnaces and in contact with corrosive materials has been developed recently at Mellon Institute, Pittsburgh, according to an announcement made today by Dr. E. R. Weidlein, director of the Institute. These new refractories, which have been given the trade name "Monofrax", were evolved through the research of Dr. A. P. Thompson, incumbent of the abrasive fellowship, in cooperation with the research laboratories of The Carborundum Co.

Several large scale installations of "Monofrax" have already been made in the construction of glass melting furnaces and of furnaces for the handling of molten slag. The performance of these refractories has been outstandingly successful and it is expected that these materials will find much wider application in the erection of other types of furnaces.

"Monofrax" blocks are cast, by methods similar to those employed in foundry practice, from a melt produced in the electric furnace. Because of the non-metallic nature of their constituents, however, much higher temperatures are required than in casting iron, and the problems involved are therefore much more complex. Through the use of unique methods of forming the blocks, these obstacles have been largely overcome, with the result that this material is now available commercially.

"Monofrax" refractories have shown extraordinary resistance to erosive and corrosive attacks at high temperatures. They have proven to be particularly suitable for those uses in which a refractory is in contact with a high temperature melt, such as glass or slag. One of the preferred compositions, for example, is six times as resistant to the attack of glass at temperatures of 2700 degrees F. as the best refractory hitherto available.

The original idea that electrically fused materials might be suitable for use as refractories was first conceived by F. J. Tone, president of the Carborundum company, many years ago. The problem was undertaken by Mellon Institute about 1930 and has been under continuous study since that time. A vast number of compositions were tried out in the laboratory, and following the selection of the most promising formulas, extensive development work has led to numerous industrial applications.

Hauck Proportioning Oil Burner

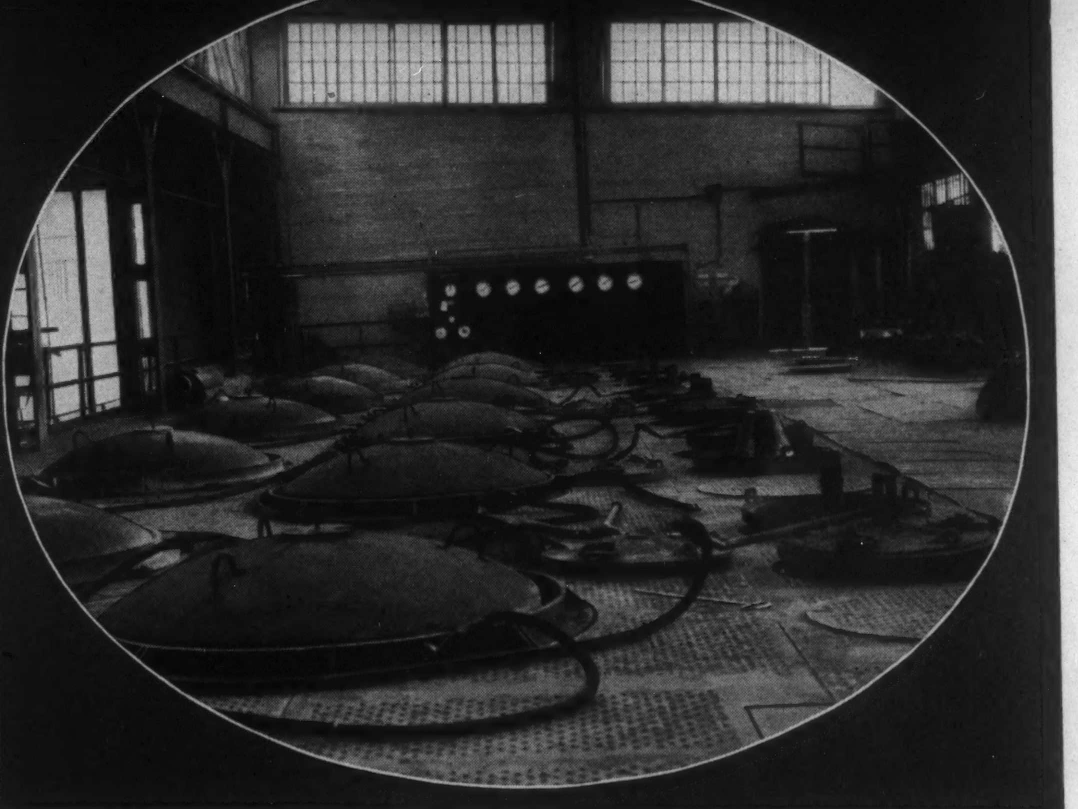
First introduced on a trial basis in January, 1937, this burner has performed remarkably in metallurgical, chemical and ceramic plants, according to the Hauck Mfg. Co., Brooklyn. It automatically proportions and maintains correct, straight line air-oil ratio from minimum to maximum capacity, giving accurate temperature control over an unusually wide operating range. It produces controlled furnace atmosphere, giving CO_2 readings between 13 and 15 per cent.

By moving a single lever, air and oil supply is automatically controlled and maintained and primary and secondary air orifices are simultaneously adjusted. This eliminates frequent adjustment of burner and regulation of air and oil valves. Very low and efficient flame turndown can be obtained. Since air is controlled by burner nozzle orifices, maximum atomizing air pressure and constant air velocity are maintained at the point of oil atomization. Thereby reduced air pressure is eliminated at point of oil atomization when burner is turned down.

This is the only burner ideally suited to automatic control. It maintains maximum combustion efficiency and perfect atomization at all positions of the burner dial. A battery of burners may be operated from one control motor, with each burner being its own individual air-oil mixer, not affecting the other proportioning burners in the group. The Hauck Proportioning Oil Burner burns any grade of fuel oil. Tests on several hundred burners on various heat processing operations are claimed to show fuel savings of from 10 to 15 per cent in oil consumption.

REPEAT ORDERS

PROVE EFFICIENCY OF PIT-TYPE FURNACES INSULATED WITH ARMSTRONG'S BRICK



One of several recent pit-type furnace installations for bright annealing wire and normalizing rod. Made by the Electric Furnace Co., the furnace is insulated with Armstrong's N-16 Insulating Fire Brick.

THE Electric Furnace Company, Salem, Ohio, has recently received repeat orders for pit-type annealers and normalizers from several of the country's most prominent rod and wire works. The original furnaces, constructed with Armstrong's Insulating Fire Brick, have successfully borne out the maker's claim that these furnaces turn out a high volume of tonnage at low cost with exceptionally satisfactory surface conditions and with great flexibility of operation.

Performance records are common in furnaces constructed with Armstrong's Brick. These efficient brick have: low thermal conductivity; high crushing strength; freedom from shrinkage; uniformity; refractoriness. They prevent heat dissipation and waste, help maintain constant temperatures, and reduce fuel costs to a minimum. For samples and descriptive literature, write Armstrong Cork Products Co., Building Materials Div., 982 Concord St., Lancaster, Pa.

Armstrong's

HIGH TEMPERATURE INSULATION

Advertisers' Index

Air Reduction Sales Company .... MA 739
Ajax Electric Company, Inc. Outside Back Cover, MA 734
Ajax Electric Furnace Corp. .... Outside Back Cover
Ajax Electrothermic Corporation Outside Back Cover, MA 760
Ajax Metal Company .... Outside Back Cover
Alpha-Lux Company, Inc. .... MA 731
Aluminum Company of America .. MA 720, MA 721
American Brass Company .... MA 769
American Bridge Company .... MA 730
American Car and Foundry Company ...... MA 740
American Chemical Paint Company .... MA 753
American Cyanamid & Chemical Corp. .... MA 735
American Electric Furnace Company ...... MA 735
American Gas Association .... MA 745
American Metal Company, Ltd. .... MA 765
Armstrong Cork Products Company .... MA 791
Baldwin-Southwark Corporation .... MA 759
Basic Dolomite, Inc. .... MA 730
Berger Manufacturing Company .... A 10, A 11
Buehler, Adolph I. .... MA 761
Burrell Technical Supply Company .... MA 760
Calorizing Company .... MA 736
Carborundum Company .... Inside Back Cover
Carnegie-Illinois Steel Corporation .... A 2, A 3
Chace Company, W. M. .... MA 765
Chapman Valve Manufacturing Company .. MA 789
Chicago Flexible Shaft Company .... MA 733
Cleveland Twist Drill Company .... A 14
Climax Molybdenum Company .... MA 722
Columbia Steel Company .... A 2, A 3, MA 730
Crucible Furnace Company .... MA 731
Dow Chemical Company, Dowmetel Division ... A 7
du Pont de Nemours & Company, Inc., E. I.
  Grasselli Chemicals Department .... A 4
Electric Furnace Company .... MA 746
General Alloys Company .... MA 738
Gordon Company, Claud S. .... MA 779
Handy & Harman .... MA 751
Hogaboom, Jr., G. B. .... MA 779
Hotel Adelphia .... MA 778
Hotel Hollenden .... MA 740
Hotel Book-Cadillac .... MA 770
Houghton & Company, E. F., ... Inside Front Cover
Illinois Testing Laboratories, Inc. .... MA 740
International Nickel Co., Inc. ...... A 16, MA 719

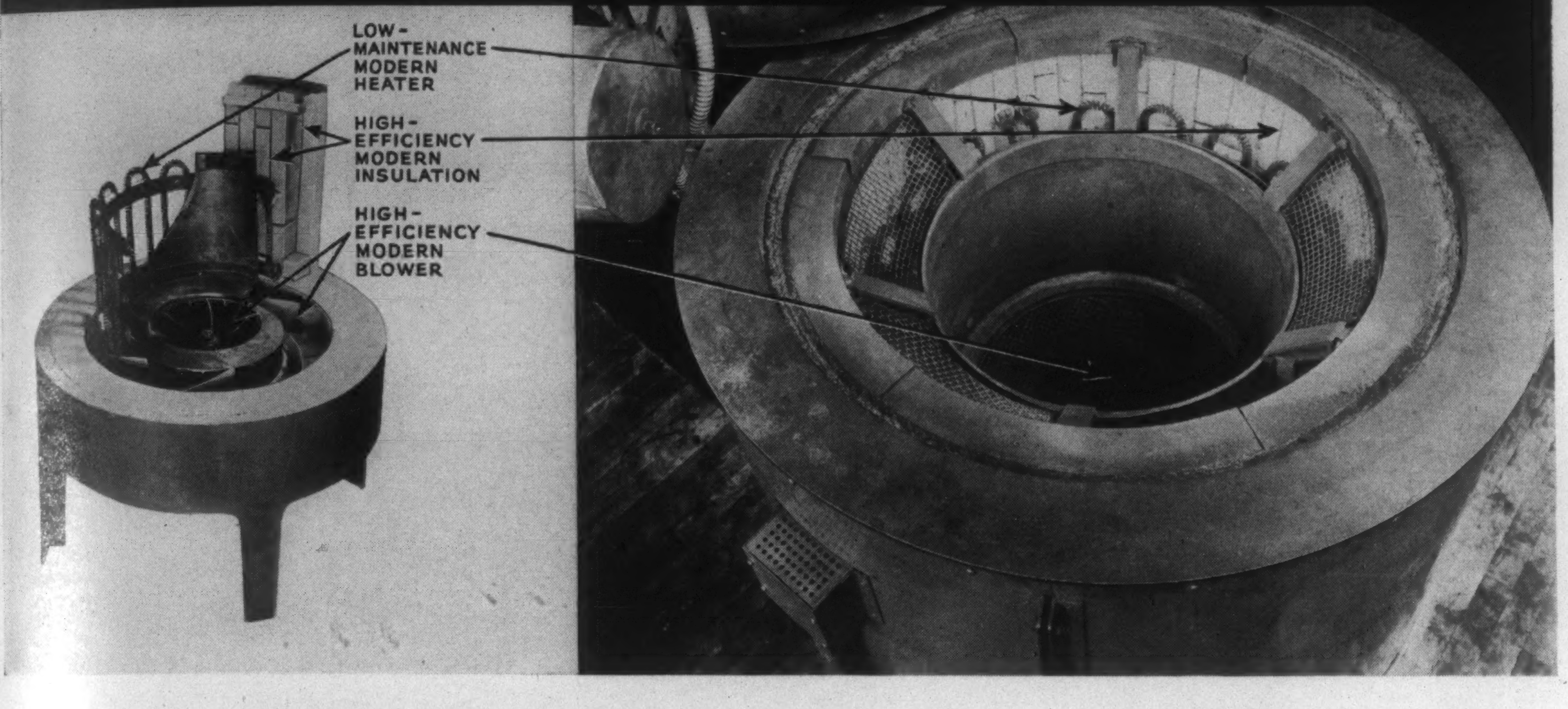
ADVERTISING OFFICE
330 W. 42ND ST., NEW YORK, N. Y.

PHILIP H. HUBBARD . . *Publishing Director*
WM. P. WINSOR . . . *Business Manager*
D. B. McINTOSH . *Eastern Advertising Manager*

BRANCH OFFICES
CHICAGO, ILL. . . . . . *310 South Michigan Avenue*
G. E. Cochran, Western Manager
CLEVELAND, OHIO . . . *1133 Leader Bldg.*
J. Howard Wilson, District Manager

Jelliff Manufacturing Corporation, C. O. ... MA 746
Johns-Manville Corporation .... MA 742
Jones & Laughlin Steel Corporation .... A 13
Leeds & Northrup Company .... A 1, A 22
Leitz, Inc., E. .... MA 760
Lepel High Frequency Laboratories, Inc. ... MA 762
Lincoln Electric Company .... MA 748
Lindberg Engineering Company MA 725, 738, 747, 753
Maurath, Inc. .... MA 749
Metal Hydrides, Inc. .... A 15
Michigan Steel Casting Company .... MA 741
Mullite Refractories Company .... A 9
New Jersey Zinc Company .... A 20
New York Testing Laboratories .... MA 779
Norton Company .... A 8
Ohio Ferro-Alloys Corporation .... MA 729
Pitkin, Inc., Lucius .... MA 779
Pittsburgh Lectrodryer Corporation .... MA 734
Quigley Company, Inc. .... MA 733
Republic Steel Corporation .... A 10, A 11
Revere Copper & Brass, Inc. .... A 18
Ryerson & Son, Inc., Joseph T. *Insert between pages* A 8 and A 9
Spencer Turbine Company .... MA 743
Steel & Tubes, Inc. .... A 10, A 11
Tagliabue Manufacturing Company, C. J. .. MA 737
Taylor Sons Company, Charles .... MA 744
Technical Translation Bureau .... MA 779
Thermal Syndicate, Ltd. .... MA 742
Timken Steel & Tube Company .... MA 793
Titanium Alloy Manufacturing Company .. MA 746
Truscon Steel Company .... A 10, A 11
Union Drawn Steel Company .... A 10, A 11
United States Metals Refining Company ... MA 765
United States Steel Corporation ... A 2, A 3, MA 730
United States Steel Products Co. .. A 2, A 3, MA 730
Vanadium Corporation of America .... MA 794
Welsh, Thomas W. B. .... MA 779
Westinghouse Electric & Mfg. Co. .... A 5
Whiting Corporation .... A 12
Wilson Company, H. A. .... MA 775
Wilson Mechanical Instrument Co., Inc. .... MA 757
Youngstown Sheet and Tube Company .... A 6

Modern
HOMO FURNACES


LOW-MAINTENANCE MODERN HEATER
HIGH-EFFICIENCY MODERN INSULATION
HIGH-EFFICIENCY MODERN BLOWER

FOR HIGH QUALITY AND LOW MAINTENANCE

Look at any one of our complete line of *modern Homo furnaces* and you'll find not merely the correct forced-convection Homo principle . . . you'll find Homo forced-convection applied in a furnace construction which, in every detail, has been thoroughly engineered for the application of that principle at its best.

You'll find a new low-maintenance heater, offering advantages as distinctive today as those offered by the Homo method itself a dozen years ago — a heater outstanding for efficiency and long life.

You'll find a fan to which as much engineering care has been given as many designers give to entire units of major equipment — a fan for the particular model of furnace you are examining, whether for dense, semi-dense or open loads.

You'll find stream-lined air passages, completely enveloping the work chamber so that a continuous rush of air swirls across the heaters . . . pours heat through the work . . . travels the short, circular path with minimum friction and radiation loss.

In these compact, self-contained furnaces, remarkably economical of floor space, you'll find the above and other important details designed correctly and built correctly, of thoroughly tested materials.

LEEDS & NORTHRUP COMPANY, 4925 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

J-T625(7a)

Metals and Alloys, published monthly by Reinhold Publishing Corporation. Publication Office: East Stroudsburg, Pa. Executive Offices: 330 West 42nd St., New York, N. Y. Entered as second class matter June 12, 1934, at the Post Office at East Stroudsburg, Pa., under the Act of March 3, 1879. $3.00 a year in U.S.; foreign, $4.00. Vol. 8, No. 12.

THE WONDERFUL “ONE-HOSS SHAY”

Have you heard of the wonderful one-hoss shay,
That was built in such a logical way
It ran a hundred years to a day.

Seventeen hundred and fifty-five.
Georgius Secundus was then alive,—
That was the year when Lisbon-town
Saw the earth open and gulp her down,
It was on that terrible Earthquake-day
That the Deacon finished the one-hoss shay.

Now in building of chaises, I tell you what,
There is always *somewhere* a weakest spot,—
In hub, tire, felloe, in spring or thill,
In panel, or crossbar, or floor, or sill,
In screw, bolt, thoroughbrace,—lurking still,
Find it somewhere you must and will.

But the Deacon swore (as Deacons do, with an “I dew vum,” or an “I tell yeou,”)
He would build one shay to beat the taown
It should be so built that it *couldn*’ break daown:
—“Fur,” said the Deacon, “ ’t ’s mighty plain
Thut the weakes’ place mus’ stan’ the strain;
’n’ the way t’ fix it, uz I maintain,
Is only jest
T’ make that place uz strong uz the rest.”

So the Deacon inquired of the village folk
Where he could find the strongest oak,
That couldn’t be split nor bent nor broke,—
That was for spokes and floor and sills;
He sent for lancewood to make the thills;
The crossbars were ash, from the straightest trees;
The panels of white-wood, that cuts like cheese,
But lasts like iron for things like these;
The hubs of logs from the “Settler’s ellum,”—
Last of its timber,—they couldn’t sell ’em,
Step and prop-iron, bolt and screw,
Steel of the finest, bright and blue;
Thoroughbrace bison-skin, thick and wide;
Boot, top, dasher, from tough old hide
Found in the pit when the tanner died.
That was the way he “put her through.” —
“There:” said the Deacon, “naow she’ll dew.”
Do! I tell you, I rather guess
She was a wonder, and nothing less!
Colts grew horses, beards turned gray,
Deacon and deaconess dropped away,
But there stood the stout old one-hoss shay
As fresh as on Lisbon-earthquake-day!

EIGHTEEN HUNDRED;—it came and found
The Deacon’s masterpiece strong and sound.
Eighteen hundred increased by ten;—
“Hahnsum kerridge” they called it then.
Thirty and forty at last arrive,
And then come fifty, and FIFTY-FIVE.

FIRST OF NOVEMBER,—the Earthquake-day.—
There are traces of age in the one-hoss shay,
A general flavor of mild decay,
But nothing local, as one may say.
There couldn’t be,—for the Deacon’s art
Had made it so like in every part
That there wasn’t a chance for one to start.

First of November, ’Fifty-five!
This morning the parson takes a drive.
Now, small boys, get out of the way!
Here comes the wonderful one-hoss shay.

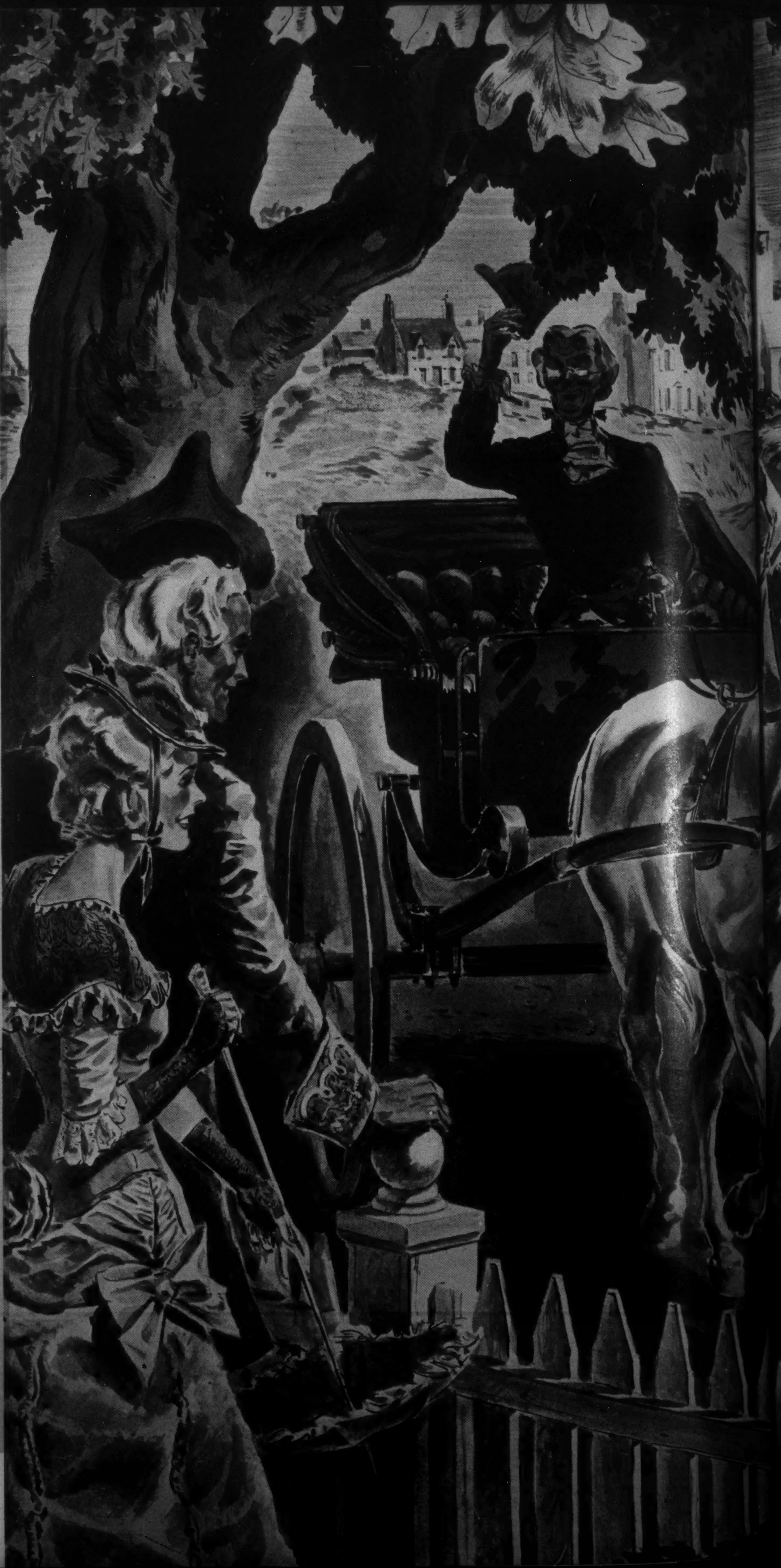
The parson was working his Sunday’s text,—
Had got to *fifthly*, and stopped perplexed
At what the—Moses—was coming next.
—First a shiver, and then a thrill,
Then something decidedly like a spill,—
And the parson was sitting upon a rock!
At half-past nine by the meet’n’-house clock;—
Just the hour of the Earthquake shock!
—What do you think the parson found,
When he got up and stared around?
The poor old chaise in a heap or mound,
As if it had been to the mill and ground!
You see, of course, if you’re not a dunce,
How it went to pieces all at once,—
All at once, and nothing first,—
Just as bubbles do when they burst.

End of the wonderful one-hoss shay.
Logic is logic. That’s all I say.

OLIVER WENDELL HOLMES

Condensed from Oliver Wendell Holmes for those who haven’t read his delightful poem since grammar-school days—and because it illustrates so aptly the reason for the increasing use of U·S·S Carilloy Alloy Steels.

USS



"Fur," *said the Deacon,*
"'t's mighty plain

thut the weakes' place
mus' stan' the strain..."

That strengthening of vital parts is the job U·S·S Carilloy Alloy Steels are designed to do

HE was born 200 years too soon—that delightful deacon who built the famous one-hoss shay—for he was an engineer at heart. With his penchant for making each part "uz strong uz the rest" he was doing just the job that automotive engineers are accomplishing today with such outstanding success.

And the parallel does not stop there.

When the deacon "inquired of the village folk" he was going to headquarters for help and cooperation in finding better and stronger materials, just as automotive engineers are when they call in alloy specialists from the metallurgical laboratories of Carnegie-Illinois.

When he selected "crossbars of ash from the straightest trees" and "steel of the finest, bright and blue" he was exercising the same painstaking selection of materials as automotive engineers when they specify carefully developed grades of U·S·S Carilloy Alloy Steels to strengthen vital parts.

Their new 1938 models will be no less outstanding than the deacon's masterpiece, because today's conception of fine performance includes both long life and that smooth, trouble-free joy of driving which makes a hesitant prospect decide to trade.

We salute these ingenious automotive engineers — the modern prototype of Holmes' ingenious Deacon.

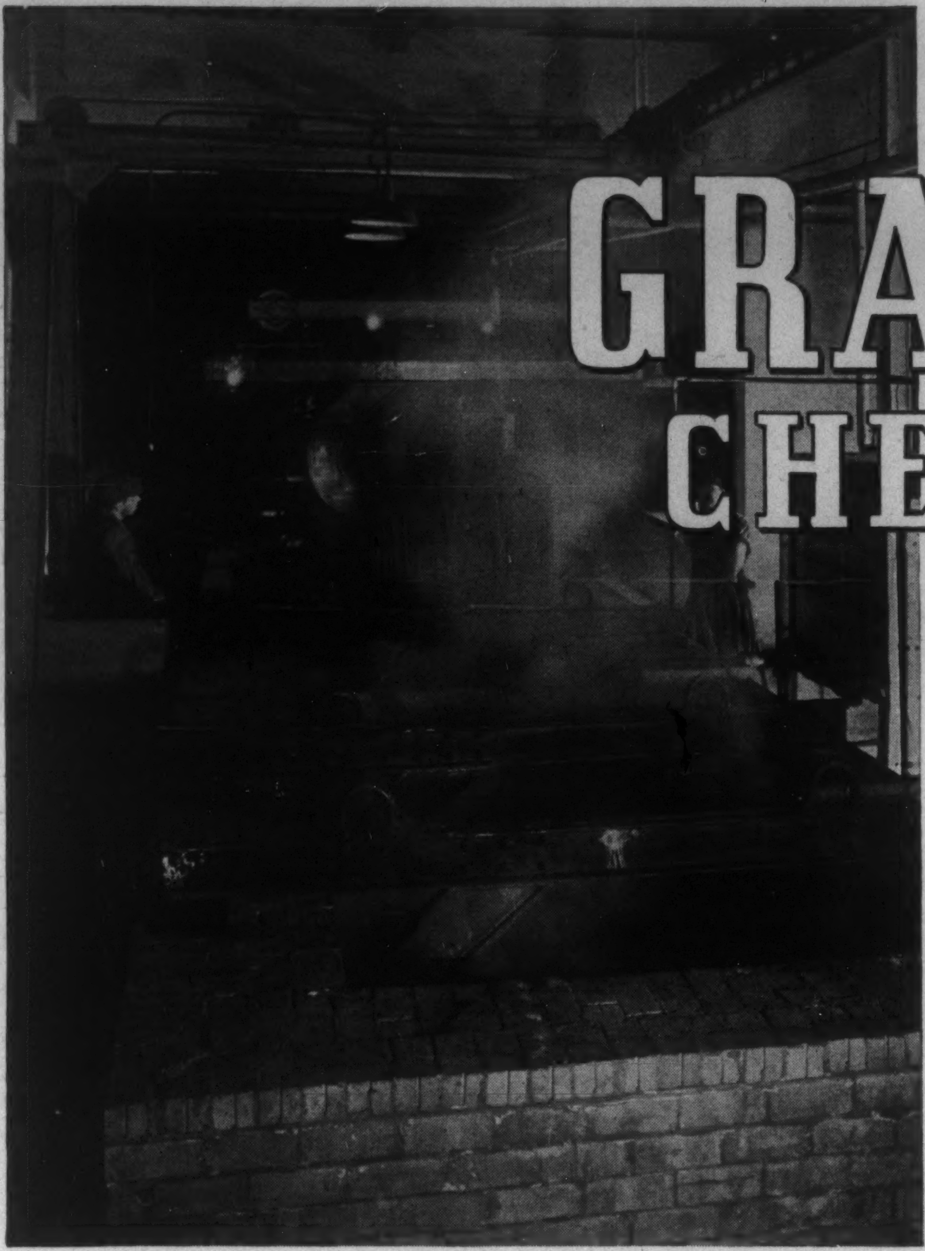
We take pride in supplying them with the finest alloy steels it is now possible to make, for strengthening the vital parts in their designs. We take pleasure in working with them, to develop even finer alloy steels to achieve new heights in smooth performance.

U·S·S CARILLOY ALLOY STEELS

CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL



GRASSELLI CHEMICALS

- Commercial Acids
- C. P. Reagents
- Fluxes
- Inhibitors
- Metal Cleaners

Serving the Chemical Needs of the Steel Industry . . . better each year

- For the metal industry, the Grasselli list includes: Commercial Acids, Fluxes, Inhibitors, Cleaners, Zinc, and C. P. Reagents.
- To better serve industry, Grasselli Chemicals are stocked at either plants or warehouses in most manufacturing centers.

Specify GRASSELLI when ordering any of the following:

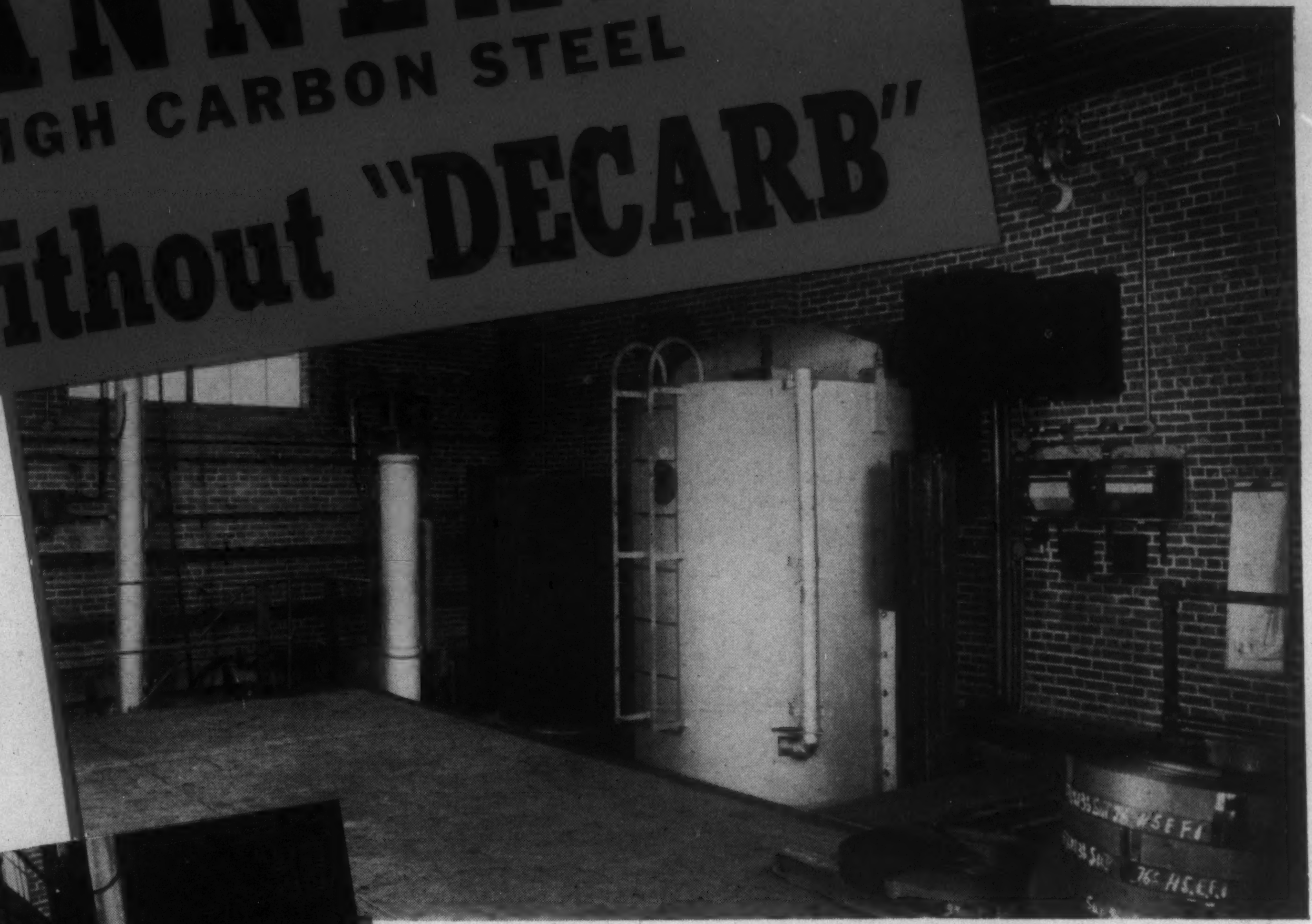
Aluminum Stearate
Caustic Soda
C. P. Reagents
Hydrofluoric Acid
Inhibitors
Mono Phosphate of Soda
Muriatic Acid
Nitrate of Soda
Nitric Acid
Sal Ammoniac
Sal Soda
Silicate of Soda
Sulphate of Alumina
Sulphuric Acid
Sulphur
Tinning Flux
Tri-Sodium Phosphate
Zinc Ammonium Chloride
Zinc Sulphate

E. I. DU PONT DE NEMOURS & COMPANY, INC.
GRASSELLI CHEMICALS DEPARTMENT
Wilmington, Delaware

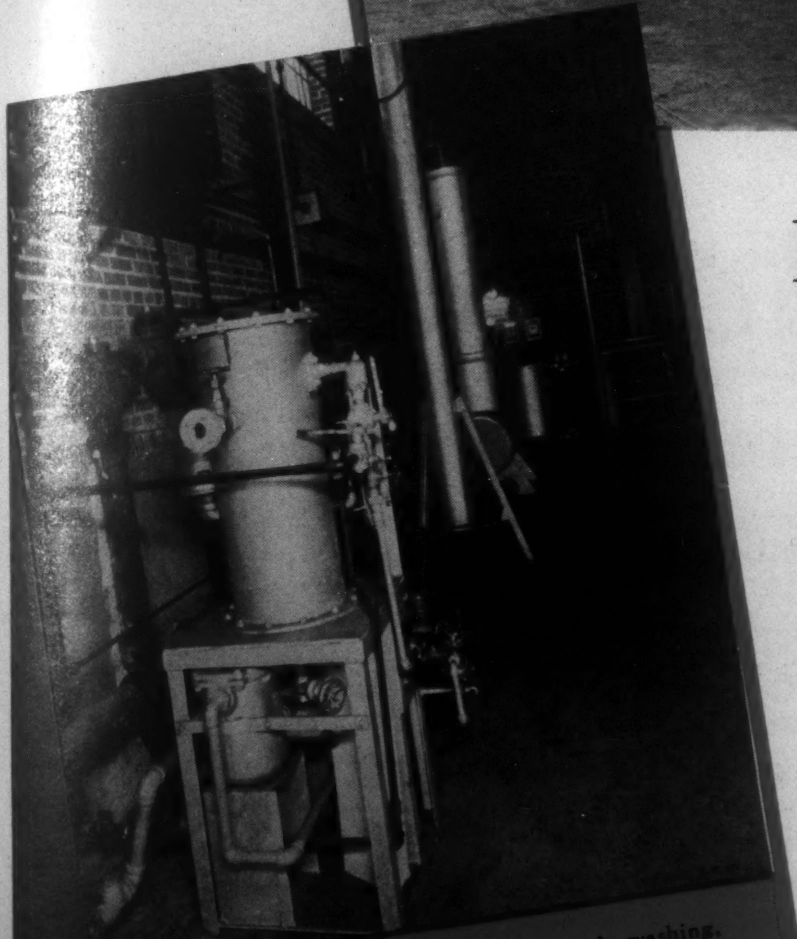
Albany
Birmingham
Boston
Charlotte
Chicago
Cincinnati
Cleveland
Detroit
Milwaukee
New Haven
New Orleans
New York
Philadelphia
Pittsburgh
San Francisco, 584 Mission St.
Los Angeles, 2260 E. 15th St.
St. Louis
St. Paul

Represented in Canada by CANADIAN INDUSTRIES, LTD.
General Chemicals Division, Montreal and Toronto

ANNEAL HIGH CARBON STEEL without "DECARB"



Complete Bell Furnace Installation for annealing high carbon strip and rod in an atmosphere of processed city gas.



Gas processing equipment—CO_2 removal—washing, drying.

PROPERLY refined city gas can now be used to anneal high carbon steel so it will come out of the furnace bright and without decarburization.

The gas processing equipment removes the causes of carburization from the gas, both the CO_2 and the moisture. After passing thru this type system the gas is thoroughly dried and there is less than 0.2% CO_2 present. The consistently low CO_2 percentage is your real assurance of freedom from decarburization.

This newly developed hydrocarbon gas processing equipment now makes practical the use of Westinghouse electric annealing furnaces with atmospheres derived from ordinary city gas for annealing high carbon strip and rod.

For information on how Westinghouse heat treating furnaces can help solve your problems of annealing high carbon steel without decarburization, call your nearest Westinghouse office or write Department 7-N, Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa.

J 10059

WESTINGHOUSE ELECTRIC

Westinghouse

Old Cap Carter

puts a steel mill to work

A million American dinners tonight, of delicious deep-sea fish, would never be eaten except for steel. First the old fisherman must mend his nets with a steel needle. Then he puts to sea in a steel boat, unloads his catch into a steel trough, cleans and prepares the fish with steel implements, and finally ships the fish in steel cans plated with tin.

Last year American housewives opened many thousands of tons of these cans .... you could almost say we would be without sea food if it were not for steel.

In the lives of every one of us, steel plays a vital part. That fact is never for a moment forgotten at Youngstown, and research goes on continuously, to keep down the costs and increase the value of the countless steel products you use every day. We feel that we are working for you, the customer, more than for ourselves.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels
General Offices - YOUNGSTOWN, OHIO

QUALITY YOUNGSTOWN SERVICE

Sheets - Plates - Pipe and Tubular Products - Conduit - Tin Plate - Bars Rods - Wire - Nails - Unions - Tie Plates and Spikes

25-3A

YOUNGSTOWN

Bell & Howell, producers of fine motion picture cameras and projectors, use Dowmetal to achieve lighter weight without sacrifice of strength or durability. Shown is a 400-foot film magazine, weighing only 5 pounds, used with the famous Eyemo camera.

Wheel and brake castings on this airplane wheel are entirely of Dowmetal. Here Dowmetal meets the demand for extreme lightness and exceptional strength in withstanding severe landing stresses.

DOWMETAL SAND CASTINGS

Dowmetal sand castings are furnished in different compositions and heat treatments depending upon the properties required for the intended service. The dependability of Dowmetal sand castings is indicated by their extensive use in airplane construction where this metal has replaced heavier materials in motor castings, instrument housings, landing wheels and miscellaneous structural supports and brackets. The portable tool industry is a large user of Dowmetal sand castings in the handles, gear housings and motor cases of electric and pneumatic drills, grinders, sanders, etc. The above are but two of the many fields in which Dowmetal sand castings have established themselves through

Platens made of Dowmetal give new lightness and higher operating efficiency in typewriters and business machines made by The Standard Register Company.

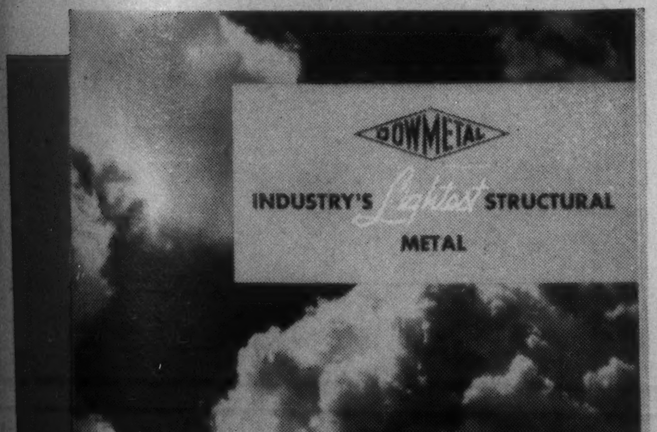
AVERAGE PROPERTIES OF DOWMETAL H SAND

Tensile Strength—lb./sq. in.
Yield Strength—lb./sq. in.
Elongation in 2"—Per Cent
Brinell Hardness
Fatigue Endurance Limit—lb./sq. in.

Pattern equipment designed for aluminum is generally satisfactory for Dowmetal, the shrinkage approximately the same. New patterns

A NEW
DOWMETAL
BOOKLET

ILLUSTRATING LIGHTNESS IN PRODUCTS



Just published, this booklet illustrates how the extreme lightness of DOWMETAL* is benefiting the products of many industries. Every manufacturer will be interested in seeing how this lightest of all structural alloys has effected substantial savings in weight, greatly reduced power costs and lessened vibration. And how in every case it has contributed these advantages without sacrifice in strength and durability.

For the executive concerned with sales, this booklet shows how DOWMETAL has given many products increased sales appeal by giving them new lightness.

There is a condensed description of the properties and adaptability of DOWMETAL sand and permanent mold castings, die castings, extruded shapes and forgings. Methods of working, fabricating and finishing DOWMETAL are likewise discussed, along with its excellent machinability.

Every organization producing metal products should have a copy of this booklet. No executive can afford to overlook the advantages of new lightness in his product. Send for your copy of "Industry's Lightest Structural Metal."

THE DOW CHEMICAL COMPANY, *Dowmetal Division*, MIDLAND, MICHIGAN
Branch Sales Offices: 30 Rockefeller Plaza, New York City — Second and Madison Streets, St. Louis —Field Building, Chicago

DOWMETAL EXHIBIT—*You are cordially invited to the DOWMETAL Exhibit at the Metals and Plastics Bureau, International Building, Rockefeller Plaza, New York City.*

DOWMETAL

*Trade Mark Reg. U. S. Pat. Off.

MAGNESIUM ALLOYS
LIGHTEST OF ALL STRUCTURAL METALS

FOR MELTING METALS

REFRACTORY
CEMENT
NORTON

In many types of furnaces for melting ferrous and non-ferrous metals, Norton Alundum (fused alumina), Crystolon (silicon carbide) and fused magnesia cements and bonded shapes are widely used—in different mixtures to meet different conditions. Their special features are: resistance to high temperatures, chemical resistance, and low permeabilities to molten metals and oxides.

R-585

NORTON COMPANY, WORCESTER, MASS.
New York Chicago Cleveland

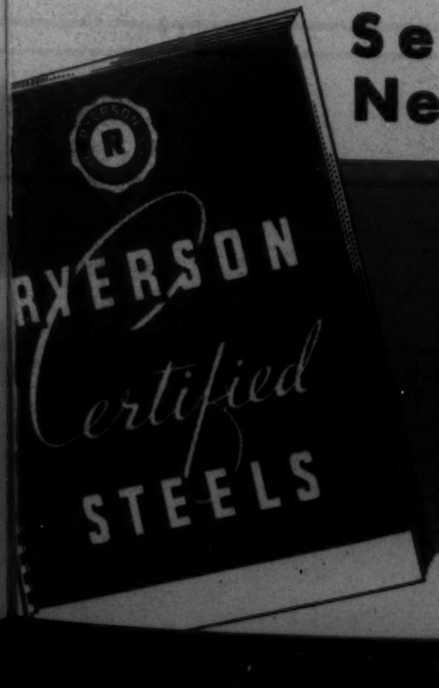
NORTON

NORTON
REFRACTORIES

RYERSON
R
CERTIFIED STEELS

CARBON STEELS
STAINLESS STEELS
ALLOY STEELS

Cost No More . . .



Send for New Book

Ryerson Certified Steels are the result of many years of [illegible] copy of the new book.

Mail this Prepaid Card

Please send me your new book explaining how Ryerson Certified Steels will save time and money.

Name ________ Position ________

Company ________

Local Address ________

City ________ State ________

K1

Ryerson Certified Steels

Uniform High Quality—At No Extra Cost

For many years we have been planning and preparing. Specifications were made more accurate and inspections more rigid. The task was slow and difficult but now at last we are able to certify to the known uniform high quality of all Ryerson steels.

A big step forward is taken on alloys, with a plan never before attempted by a steel-service company.

Whole heats of alloy steels, of ideal analyses, are selected, tested and data prepared.

This data including chemical and physical properties, actual heat treatment response, etc., is sent along with every shipment. The heat treater then knows exactly what is in every bar and how to secure the best possible results.

These special services have been developed to meet the growing needs of industry and are offered without increased cost or obligation.

If you are not already taking advantage of this unique plan, we urge you to call in your nearest Ryerson representative who will be glad to give you the complete story.

The new book showing how Ryerson Certified Steels can save time and money is now ready. Mail Prepaid Post Card below for your copy.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Boston, Buffalo, Philadelphia, Jersey City.

USE PREPAID CARD
for Illustrated Book on Certified Steels

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
FIRST CLASS PERMIT No. 143, SEC. 510 P. L. & R., CHICAGO, ILL.

JOSEPH T. RYERSON & SON, INC.
LOCK BOX 8000-A
CHICAGO, ILL

Certified Stocks Include

Hot Rolled Alloys
S. A. E. 2315, 2320, 2330, 2335, 2340, 2345, 2350, 3115, 3120, 3130, 3135, 3140, 3250, 4140, 4615, 6145, 52100; Rycase (hot rolled machine straightened); Rytense A. A. (hot rolled).

Cold Drawn Alloys
S. A. E. 2315, 2320, 2330, 3115, 3120, 3135, 3140.

Heat Treated Alloys
Ryco (hot rolled, machine straightened); Rycrome (hot rolled, cold drawn, machine straightened); Nikrome "M" (hot rolled, machine straightened); Ry-Ax and Ry-Arm.

Stainless
Allegheny Stainless sheets, plates, rounds, squares, hexagons, flats, angles, pipe, tubing, bolts, nuts, etc. in a variety of finishes.

Cold Finished Steels
Standard Shafting; turned ground and polished; Special Accuracy Stock; Rycase High Manganese Screw Stock; S. A. E. 1020, 1035, 1112, 1120, etc.

Tool Steels
Ryerson B. F. D. Die Steel; Ryerson "Shock" Steel; Ryerson V. D. Steel; Ryerson High Speed Tool Steel; Ryerson Special High Speed Tool Holder Bits.

Special Sheets
21 special quality sheets. Also all standard sheets such as plain black galvanized, corrugated, etc.

General Steel Products
Beams; Channels; Angles; Tees; Zees; Plates (17 kinds); Spring Steel; Tire Steel; Refined Iron; Boiler Tubes and Fittings; Bolts; Screws; Nuts; Washers; Rivets.

Floor Plate, Stair Tread
Inland 4-Way Floor Plates and Traffic Plates; Firm-tread Diamond Pattern Floor Plate and Traffic Plates; Mason Safety Treads, etc.

Welding Rods
19 Kinds of electrodes including improved stainless steel rods, shielded arc type rods, and special processed rods, 8 kinds of acetylene rods.

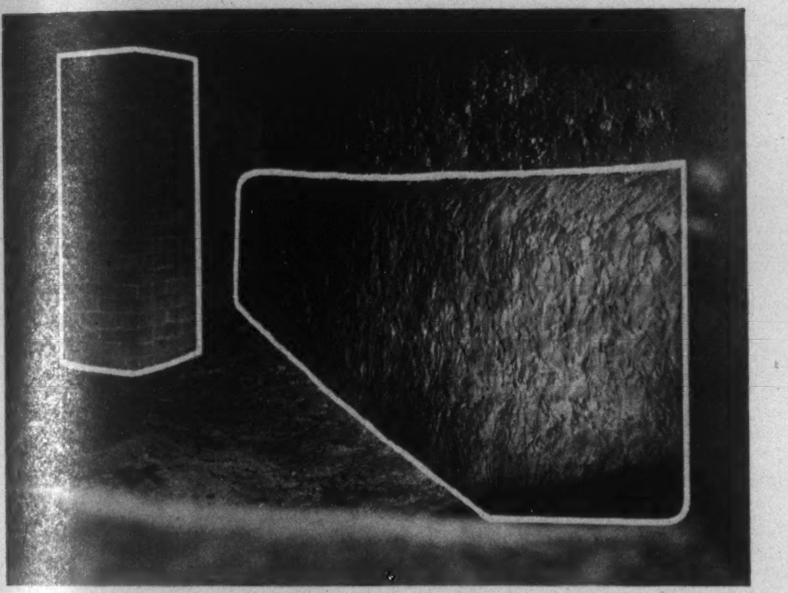
Building Products
New billet and rail steel reinforcing bars, spirals, electrically welded wire fabric, expanded metal, reinforcing mesh, caisson rings, sheet piling, bank vault reinforcing, safety treads.

Allied Products
Ryertex Bearings, Babbitt Metal, Solder, Flux, Curb Strip, Wire and Wire Rope, Chain, Slings, Slip and Grab Hooks, etc.

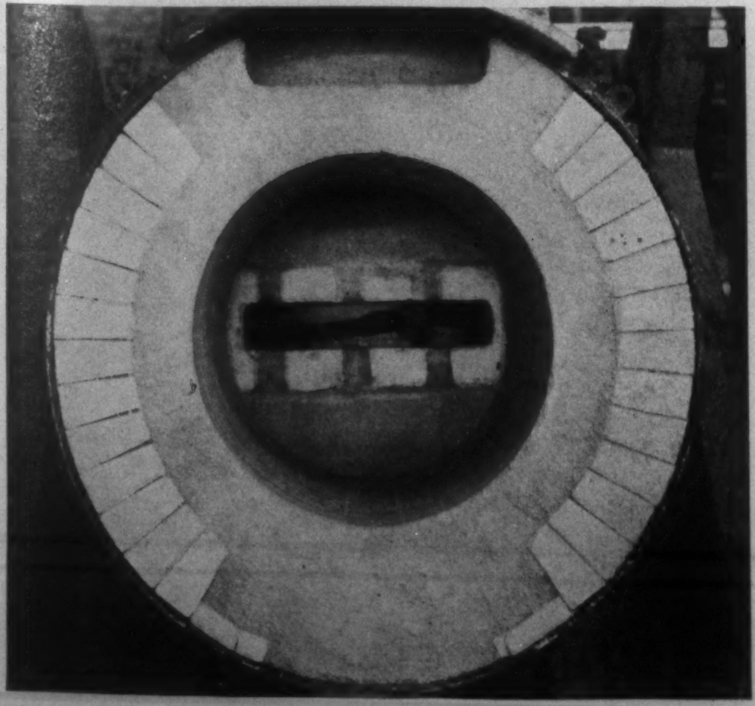
"SHAMVA" MULLITE
"SHAMVA" MULLITE
"SHAMVA" MULLITE

The Detroit electric furnace above, lined with Shamva Mullite Cement, gave 1400 heats melting nickel, as compared with 400 for the best previous refractory.

Others have proved what YOU may save



Power boiler interior showing Shamva Mullite brick pier, and SM-100 cement used for patching brick wall. Shamva Mullite gives years of uninterrupted service under severe firing conditions.

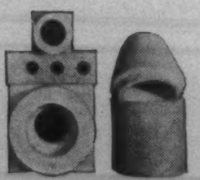


A complete Ajax electric furnace lining rammed with SM-70 cement, backed up with insulating brick. These furnaces are conclusively demonstrating the superiority of Shamva Mullite lining for non-ferrous melting.

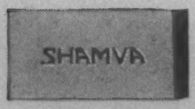
IN many fields, refractory economy through the longer service life of Shamva Mullite (sillimanite) bricks, shapes and cements has been conclusively demonstrated. If your operations call for refractories to withstand temperature between 2000 deg. and 3300 deg. F., the unique properties of Shamva Mullite will cut costs, as well as meet difficult requirements now causing trouble. Call upon a Shamva engineer, or write for our new bulletins.

THE
MULLITE REFRACTORIES
CO.

7 Canal Street **Shelton, Conn.**



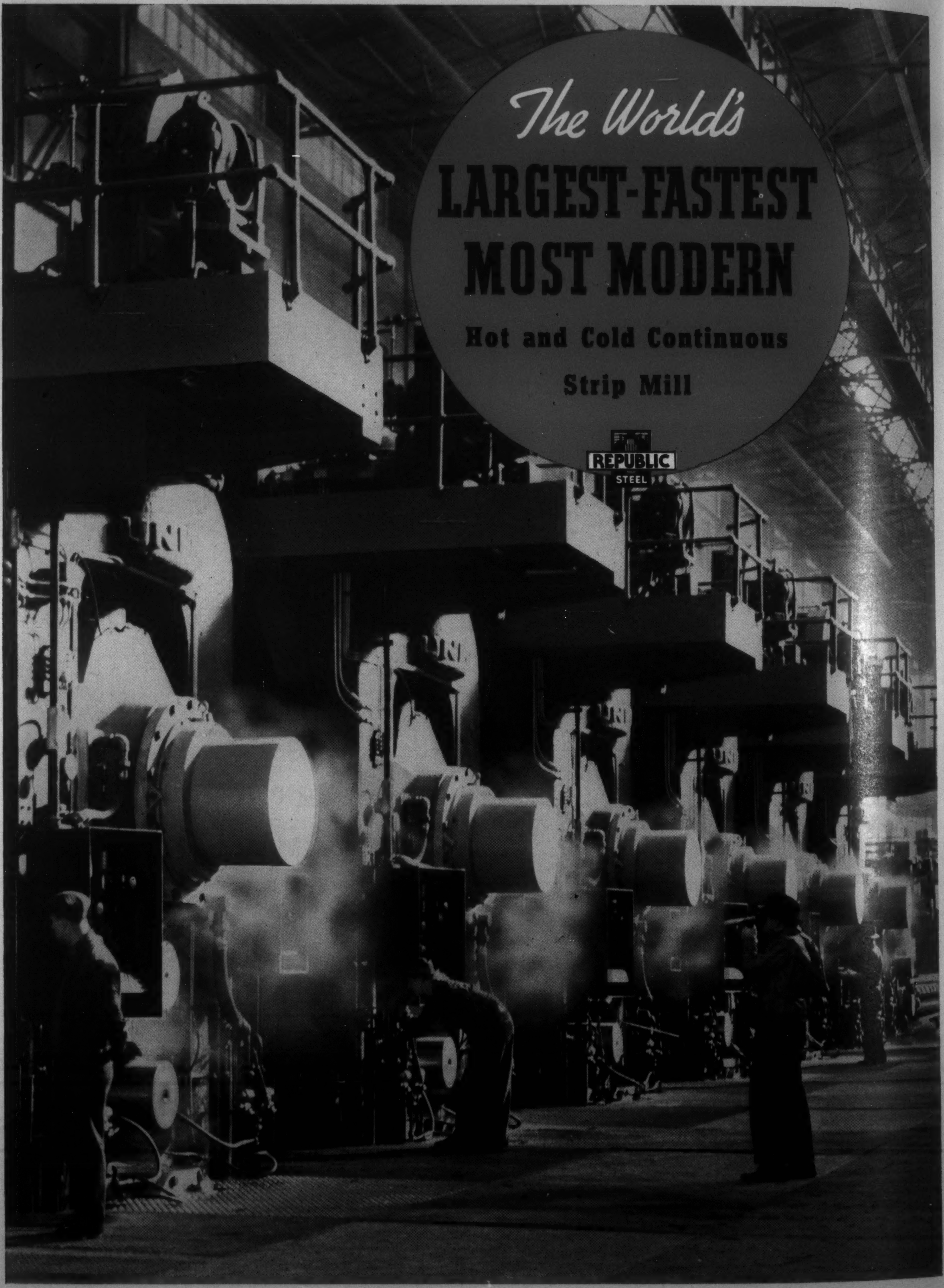
SHAPES



BRICKS

CEMENTS

OUR RESEARCH LABORATORY IS YOUR GUARANTEE OF QUALITY

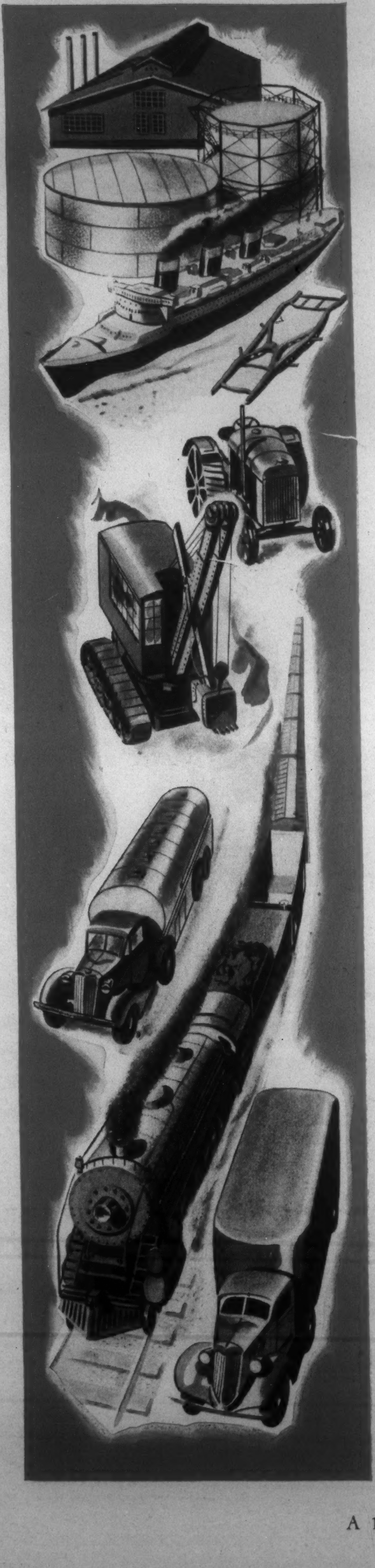

The World's
LARGEST-FASTEST
MOST MODERN
Hot and Cold Continuous
Strip Mill
REPUBLIC
STEEL

THE CUYAHOGA RIVER in Cleveland has a new bed. On what was water and swamp-land less than a year ago now stand 21 acres of buildings housing Republic's latest achievement . . . the world's largest, fastest and most modern hot and cold continuous strip mill.

Where once ran a lazy ribbon of mud and water now runs a ribbon of steel . . . steel strip up to 94 inches wide rolled at a speed of 2100 feet a minute.

A massive 98-inch hot mill, huge 98-inch and 72-inch cold mills with complete finishing equipment afford a greatly enlarged output of large and small sheets, light plates and coiled strip with unusual uniformity and accuracy in temper, ductility, surface finish, gauge and physical properties.

To you, as to every user of flat-rolled steel for any purpose, Republic's new mill means that you can now obtain sheets larger than ever before available . . . sheets that reduce fabrication costs and eliminate unsightly joints in products of large area . . . sheets that offer new possibilities in designing new products or redesigning old ones.



Republic Steel

GENERAL OFFICES • CLEVELAND, OHIO

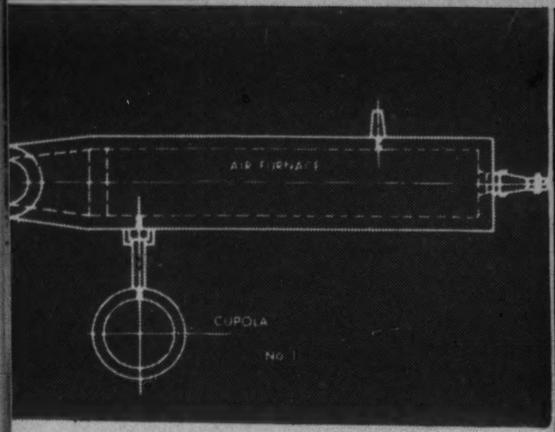
Divisions

Berger Manufacturing—Union Drawn Steel

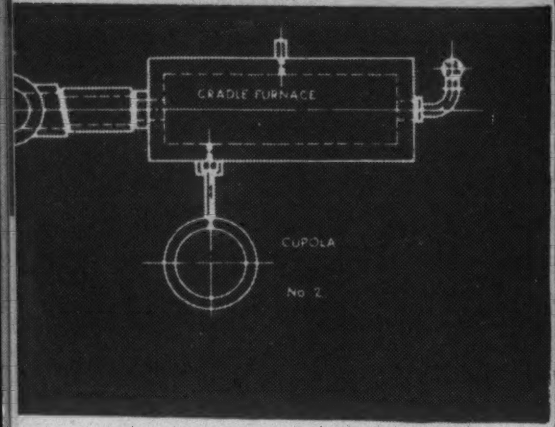
Subsidiaries

Steel and Tubes, Inc.—Truscon Steel Company

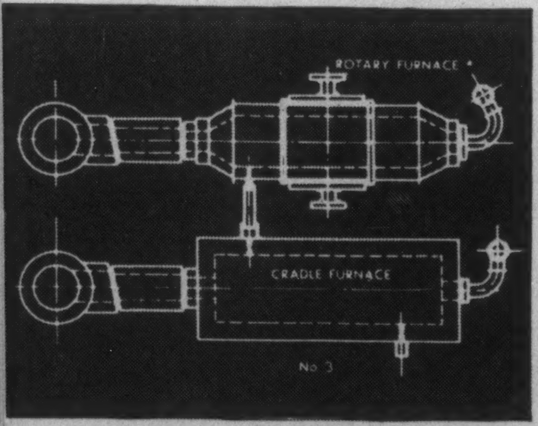
Better Metal at Lower Cost with DUPLEXING



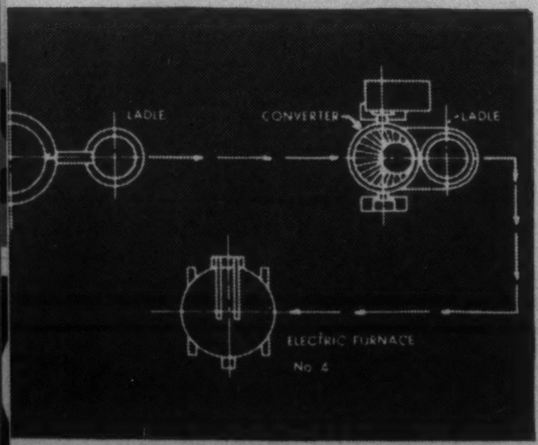
Duplexing—Cupola to pulverized-coal-fired air furnace.



Duplexing—Cupola to pulverized-coal-fired cradle furnace.



uplexing—Rotary furnace to cradle furnace, both pulverized-coal-fired.



riplexing—Cupola to side-blow converter to electric furnace.

Here Whiting pulverized coal firing equipment is applied to an air furnace for super-heating and refining the molten iron from the cupola in a large car wheel plant. Burners are water-cooled.

HAVE you considered the possibilities of duplexing for low-cost production of high-quality grey or malleable iron? To meet the greater exactness required by casting users, more and more foundrymen are adopting duplexing methods because duplexing not only gives better control of quality but also lowers cost of production.

Ability to use cheaper materials in original charge, close control of analysis, increased capacity from melting equipment, *ability to pour continuously* and use same flask several times in one day—these are all important advantages which depulexing offers to the modern foundryman.

Broad, practical knowledge of metallurgical processes and equipment gained thru years of experience enable Whiting engineers to co-ordinate various melting units in the duplexing method best suited to individual requirements.

Our engineers will gladly study your problem at your convenience.

WHITING CORPORATION, 15705 Lathrop Ave., Harvey, Ill.

We Build for Foundries —

Cupolas (Hot or Cold Blast)
Cupola Chargers
Cupola Blowers
Brackelsberg Rotating Furnaces
Cradle Furnaces
Air Furnaces
Annealing Ovens
Steel Converters
Duplexing Equipment
Ladles—All Types
Tumbling Mills
Dust Filters
Pulverized Coal Equipment
Seacoal Pulverizers
Stokers (for Core Ovens)
Electric Traveling Cranes

WHITING

PIONEERS SINCE 1884

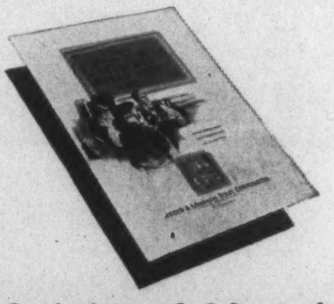
BETTER
QUALITY
PARTS
at lower cost–

WITH J&L COLD FINISHED IMPROVED BESSEMER SCREW STEEL

As an example of the superior machinability of J&L Cold Finished *Improved* Bessemer Screw Steel, consider this hose connector made by Butch & Rhodes, Philadelphia. This part is produced on a four-spindle automatic . . . formed, recessed, drilled, given interior thread and cut off . . . all within 90 seconds. A high degree of free machining is necessary to clear the hole of chips and to give a true surface when tapped at this speed.

Many manufacturers similarly report that J&L *Improved* Bessemer Screw Steel improves production and increases quality and profits. In this *improved* steel, there is no change in chemistry or physicals. Increased machinability results from an exclusive method of manufacture. And this increased machinability can save you money through greater cutting speeds . . . less tool wear . . . lower power consumption . . . smoother surface and higher quality of finished products.

J&L *Improved* Bessemer Screw Steel is available in SAE 1112 or SAE X1112 (Special High Sulphur) grade, cold finished, in mill shipments and from distributors' stocks in principal cities. Investigate the machining possibilities of this improved steel. Increase your profits . . . specify and buy Jones & Laughlin.



Get the facts on J&L *Improved* Bessemer Screw Steel. Write today, on your business letterhead, for your copy of this bulletin on Bessemer Screw Steel.

J&L STEEL PRODUCTS FOR MANUFACTURING

Hot and Cold Rolled Strip and Sheet Products . . . Seamless and Welded Tubular Products . . . Cold Finished Bars and Shapes . . . Jalcase Steel . . . Shafting . . . Spring Wire . . . Tin Plate and Black Sheets.

INCREASE YOUR PROFITS WITH
J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA
MAKERS OF HIGH QUALITY IRON AND STEEL PRODUCTS SINCE 1850

Test No. 1

Lathe tools turning a bearing on automobile crankshafts. SAE 1045, Brinell 240, Soluble Oil Coolant. Taking the average of 40 grinds, MO-MAX tools turned 129 shafts per grind. 18-4-1 tools turned 116 shafts per grind.

Test No. 2

Engraving Cutters cutting dry on tire molds made of hard Cast Iron. Taking the average of 5 cutters, MO-MAX tools completed 47 blocks per grind. 18-4-1 tools completed 40 blocks per grind.

Test No. 3

15/16" Taper Shank Drills used in cluster gear forgings, drilling 6½" deep. SAE 1040, Brinell 210. Soluble Oil Coolant. Speed 235 R.P.M., Feed .013" per revolution. Taking the average of 16 grinds, MO-MAX drills completed 49 forgings per grind. 18-4-1 drills completed 38 forgings per grind.

Test No. 4

15/16" Taper Shank Straight Flute Bridge Reamers used in steel forgings, cutting dry. Speed 450 R.P.M. in a high cycle machine, hand feed. Taking the average of 14 grinds, MO-MAX reamers completed 132 holes per grind. 18-4-1 reamers completed 102 holes per grind.

About Tests

Frankly speaking, the above four tests have been selected. They were selected because they were near the average of all the tests on record and because they were typical. All were made on production jobs.

You know and we know that one test does not mean much. *On more than ten thousand tests Molybdenum-Tungsten high speed tools averaged twenty percent better than similar tools made of 18-4-1 steel.* Such an average obtained by careful statistical methods is dependable.

MO-MAX*

TRADE MARK REG. U.S. PAT. OFF.

Molybdenum-Tungsten High Speed Steel

has been in general commercial use for more than four years. Many tool manufacturers now use it for their regular high speed product. Many consumers are using it for the high speed tools made in their own tool rooms.

It requires 8% less weight of steel to make a tool . . . It is easy to weld . . . It is easy to forge . . . It is easy to machine . . . It is easy to grind . . . Its tools are harder . . . Its tools are tougher . . . Its tools have superior cutting quality.

Leading steel companies in North America and Europe are now licensed to make MO-MAX. A booklet giving the essential data may be obtained by addressing The Cleveland Twist Drill Company, Cleveland, Ohio.

SHIFT TO MO-MAX FOR QUALITY AND QUANTITY PRODUCTION

---

* MO-MAX is a proprietary name owned and controlled by The Cleveland Twist Drill Company and its only licensed use by others is on steel made and sold by licensees under U. S. Patent Nos. 1,937,334; 1,998,953; 1,998,954; 1,998,955; 1,998,956; 1,998,957; and Canadian Patent Nos. 346,506; 364,032 and 364,033.

7795

Hydrides and Metals

PRODUCTS OF THE HYDRIDE PROCESS

METALLIC hydrides are dissociated on heating above 300°C and give off large volumes of nascent hydrogen.

They are recommended as the source of a supply of 100% pure hydrogen.

Metallic hydrides offer new possibilities in the production of alloys due to the liberation and protective effect of nascent hydrogen during the alloying process.

Metallic hydrides are safer to handle than fine powdered metals in degassed state.

The hydrides on degassing supply pure metals either in the form of very fine powders or sintered ingots.

If you are interested in nascent hydrogen or new alloys which can be made by this process, write us for detailed information and advice.

PRODUCTS	AVAILABLE FORMS
Titanium Hydride	Powder 200-300 mesh
Zirconium Hydride	Powder 200-300 mesh
Thorium Hydride	Powder 200-300 mesh
Calcium Hydride	Lumps or Powder
Titanium Metal	Powder 200-300 mesh
Zirconium Metal	Powder 200-300 mesh
Thorium Metal	Powder 200-300 mesh
Uranium Metal	Powder 200-300 mesh
Copper-Titanium Alloys	
1) Ti—30%	Ingots
2) Ti—60%	Powder 200-200 mesh
Copper-Zirconium Alloy Zr 13%	Ingots
Nickel-Titanium Alloys Ti 20 to 60%	Ingots

Patents issued and pending in the U.S.A. and Foreign Countries

HYDRIDES
AND
METALS

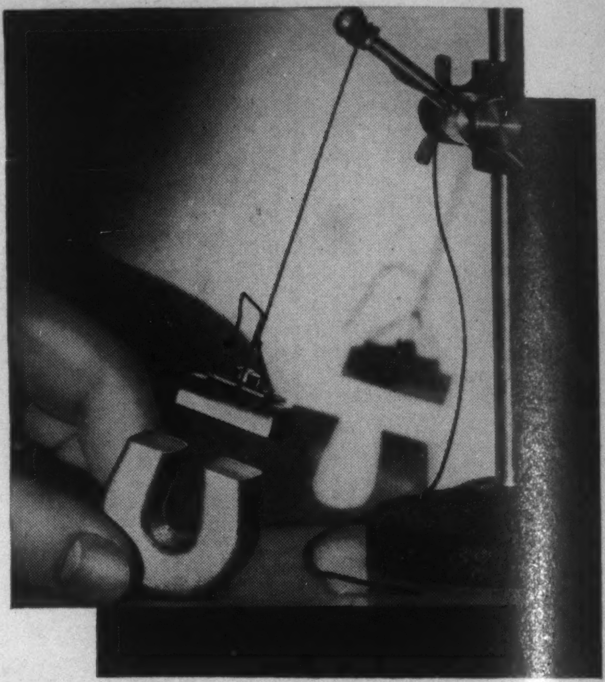
METAL HYDRIDES INC.

BOX 816, CLIFTON, MASSACHUSETTS

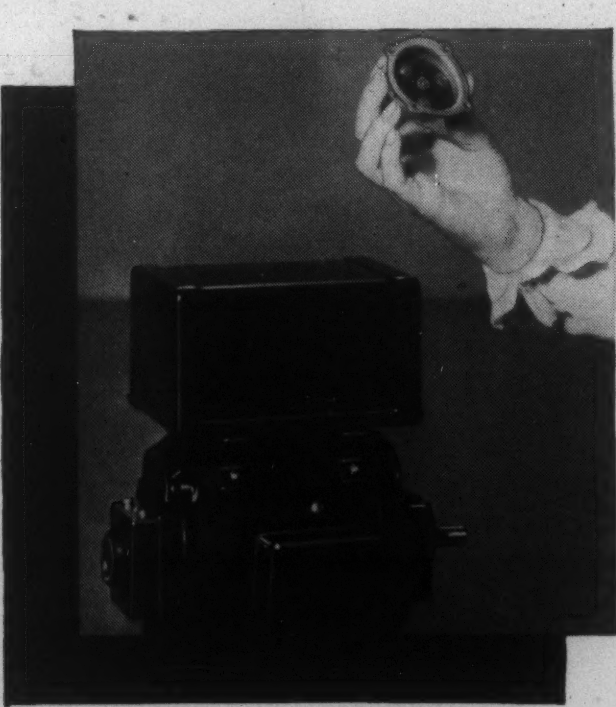
HIGH NICKEL ALLOYS

RAISE EFFICIENCY AND LOWER COSTS

...in scores of special applications



HIGH MAGNETIC QUALITIES... The magnet pictured here is small, but extraordinarily powerful—capable of lifting 60 times its own weight. This particular type, made of a new alloy rich in Nickel, is used for damping magnets in the polyphase meters of the Duncan Electric Co., Lafayette, Ind. Not only do these alloys of high Nickel content effect substantial savings in weight (in this case 80%) but they also have a higher permanency factor than other commercially available magnetic materials and are practically immune to the effects of magnetic disturbances caused by short circuits and lightning. Manufacturers who employ magnetic materials in their products will find these new alloys of Nickel profitable to investigate.

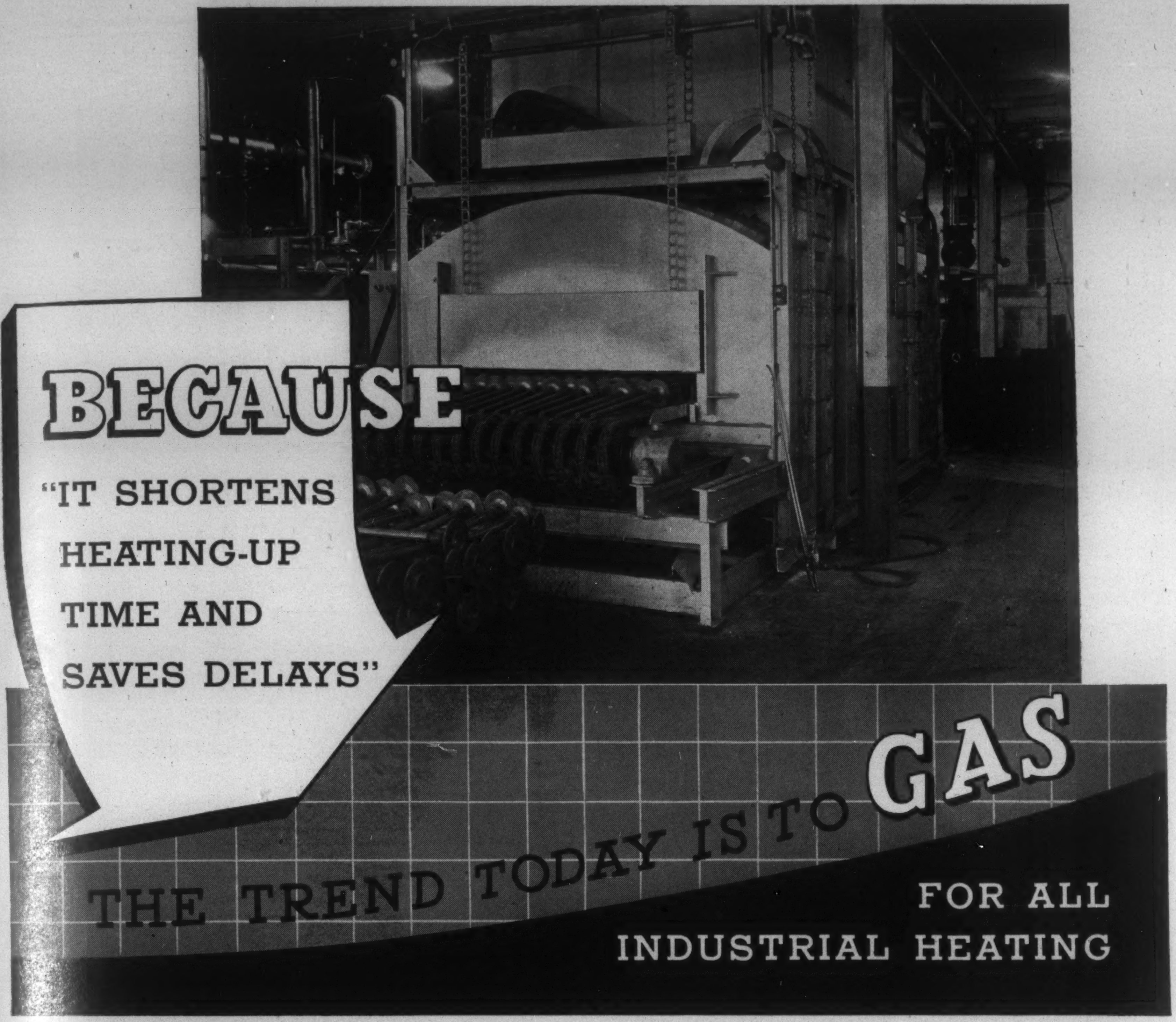


HIGH AND LOW EXPANSION PROPERTIES...

One of the most valuable metallurgical developments in recent years has been the production of thermostatic metals for operating automatic control devices. Pictured here is one employing a bi-metallic disc made of two alloys of Nickel, one having a high degree of expansion and the other low expansion properties. It guards the Westinghouse refrigerator motor, disconnecting it when it gets too hot and reconnecting it when it cools off. Principle upon which these thermostatic metals operate is based on a differential in the expansion properties of the two constituent metals. Changes in temperature cause them to deflect and this in turn acts on the control device. Alloys of Nickel can be produced for applications requiring extremely low expansions as well as for service where specific expansion characteristics may or may not be low.

IMPROVED PERMEABILITY... When you make your long distance telephone call or send a cable, a highly magnetic Nickel-Iron alloy of improved permeability containing up to 80% Nickel helps to deliver your message. Impulses sent over long circuits have a tendency to drag their "tails" behind them, upon which succeeding impulses tread. But through the use of loading coils made of a high Nickel alloy, and spaced at regular intervals along the circuit, transmission is speeded up and your words made intelligible. The high magnetic permeability of these alloys is also depended upon to increase the efficiency of submarine cables and various parts of radio, telephonic and telegraphic installations. We invite consultation on the use of the Nickel alloys in your equipment.

THE INTERNATIONAL NICKEL COMPANY, INC., NEW YORK, N.Y.


BECAUSE
"IT SHORTENS HEATING-UP TIME AND SAVES DELAYS"
THE TREND TODAY IS TO GAS
FOR ALL INDUSTRIAL HEATING

THERE'S NOTHING LIKE GAS FOR HARDENING, ANNEALING, TEMPERING, NORMALIZING, BLUEING, CARBURIZING, FORGING, GALVANIZING, CORE BAKING, NITRIDING, MALLEABLIZING AND MANY OTHER INDUSTRIAL PROCESSES

Recent improvements in gas equipment make this preferred fuel for all heat-treating operations even more economical and efficient. Up-to-date Gas applications provide quick heating, a uniformity in heat distribution, and an automatic accuracy of control, that makes for efficiency and economy, regardless of the size of either plant or job.

Cleanest of all fuels, and the highest in utilization value, Gas also is instantly available in unlimited supply, thus offering unmatched *natural* advantages which speed production, lessen shutdowns, reduce spoilage and bring appreciable savings on labor, storage and handling costs.

Let an industrial engineer from *your* gas company demonstrate how modern Gas equipment, properly installed, cuts over-all costs and puts production on a profitably flexible basis.

AMERICAN GAS ASSOCIATION

INDUSTRIAL GAS SECTION: 420 LEXINGTON AVE., NEW YORK

2%

cut the cost of

these castings

33⅓%

How's this for economy? A large plant in New York State reports that a two percent addition of Titanium alloy to their electric furnaces is making possible the production of castings equal in every respect to expensive *patented* metal... yet at a cost of from ¼ to ⅓ of the latter!

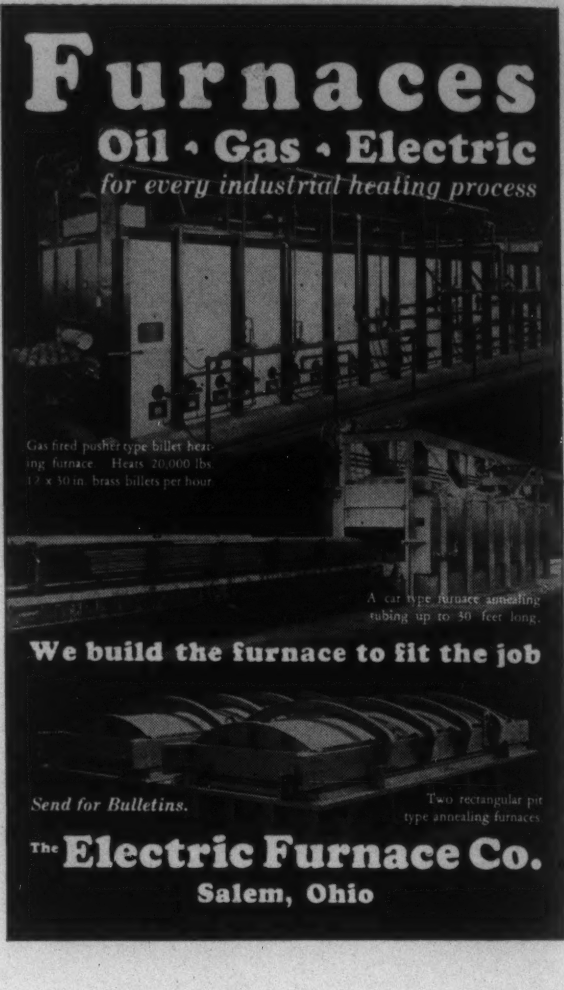
This is but one of many important contributions TAM Metallurgical Alloys are making on the "firing line" of iron and steel production. *Practical* contributions, they are, divested of so much of the metallurgical mysteries surrounding many furnace routines. In the particular case mentioned above, TAM *Original* FCT (Ferro Carbon-Titanium) No. 78 is the TAM product being used, in conjunction with certain other "compatible" alloys. Its intense cleansing and de-oxidizing ability plus its efficient graphitizing action, have won for it a prominent place in furnace practice throughout the country.

What type of iron or steel or non-ferrous metals are you producing? Stainless steel... aluminum or copper alloys? Let a TAM Engineer, backed by TAM Research experience, collaborate in the solution of present problems. Write: The Titanium Alloy Manufacturing Co., Niagara Falls, N. Y. *(Representatives in leading cities throughout the world.)*

TAM ZIRCONIUM & TITANIUM PRODUCTS

TAMCO

better performance thru better metals



Furnaces

Oil • Gas • Electric

for every industrial heating process

Gas fired pusher type billet heating furnace. Heats 20,000 lbs. 12 x 30 in. brass billets per hour.

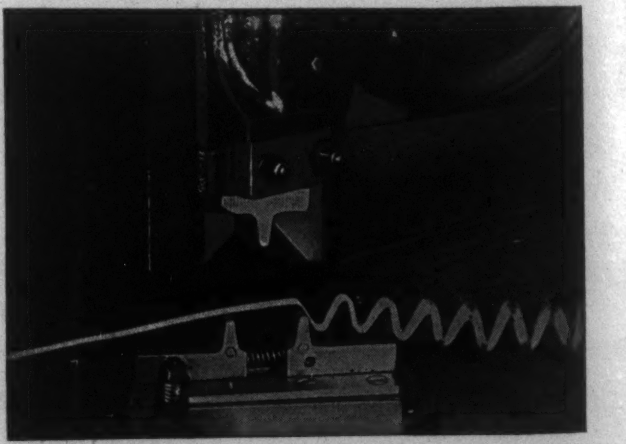
A car type furnace annealing tubing up to 30 feet long.

We build the furnace to fit the job

Send for Bulletins.

Two rectangular pit type annealing furnaces.

The Electric Furnace Co.
Salem, Ohio



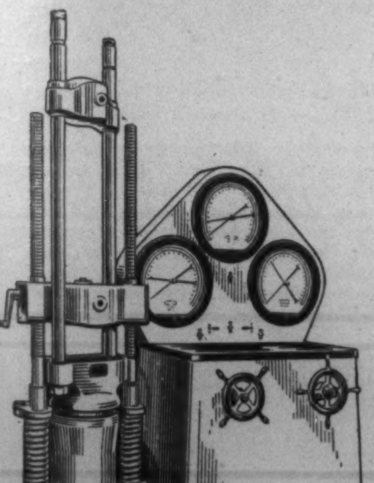
MACHINE CORRUGATION OF COLD ALLOY WIRES

The above illustration shows one method of corrugating Kanthal Alloys. This material can also be fabricated cold into coils and various shapes. In addition to Kanthal we manufacture a complete line of Nickel-Chromium and Copper Alloys in the form of wire and ribbon, which have for many years been standard for electrical heating elements.

Our experts are happy in co-operating with your engineers on resistance problems.

A large stock of alloy wires is carried in stock for prompt shipment.

THE C. O. JELLIFF MFG. CORP.
SOUTHPORT, CONN.



A wide factor of safety is built into "Pyrex" Power Insulators . . . safety maintained by frequent and thorough tests . . . tests for dielectric strength, heat resistance, thermal strength, mechanical strength and others.

The Southwark-Emery Universal Testing Machine is an important part of the testing equipment in the Corning Glass Works' laboratories . . . is in constant use for both research testing and for routine production testing in demonstrating the high mechanical strength of "Pyrex" insulators.

Leaders in industry use Southwark-Emery testing equipment. It is essential equipment . . . for testing specimens and full-size structures. Described in new Bulletin 131. Ask for a copy.

BALDWIN-SOUTHWARK CORPORATION
Southwark Division, Philadelphia, Pa.
Pacific Coast Representative: **THE PELTON WATER WHEEL CO., San Francisco**

SOUTHWARK-EMERY · testing
· machines

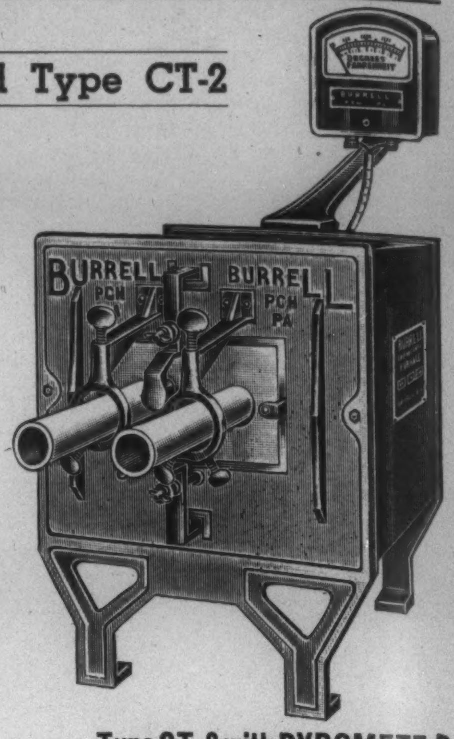
New 1937 Models

Type CT-1 and Type CT-2

BURRELL COMBUSTION FURNACES

—The first to give the extra heat needed for faster, more accurate carbons—offered in two new types incorporating important improvements, with added features, developed from a practical knowledge of laboratory needs.

- *New Pyrometer on furnace* **for easy reading**
- *High temperatures up to 2550° F—* **for fast, clean combustions** ....
- *Economical—only 1200 to 1350 watts necessary for top temperature.*
- *Two Types—Choose either one or two tube furnaces.*............
- *Tubes—Use any size combustion tube up to 1¼" I. D.*..........



Type CT-2 with PYROMETER

Ask for Bulletin 76-01

BURRELL TECHNICAL SUPPLY CO., PITTSBURGH, PA.

POURING STEEL INGOTS

from

AJAX–NORTHRUP
Laboratory Size Furnace

2 oz. melts of carbon free steel in 6 min- 1 KW
8 oz. melts of carbon free steel in 10 min- 3 KW
30 lb. melts of carbon free steel in 90 min-20 KW

Also 3 lb., 5 lb., 10 lb. and 17 lb. standard furnaces operating one at a time from 20 KW converter.

Sealed discharge gap for 2 oz. and 8 oz. steel furnaces and 2 lb. and 4 lb. brass furnaces. No moving parts. Simple and safe.

Write for Bulletins 9 and 10

AJAX ELECTROTHERMIC CORP.

Ajax Park, Trenton, N. J.

ATTENTION METALLURGISTS!

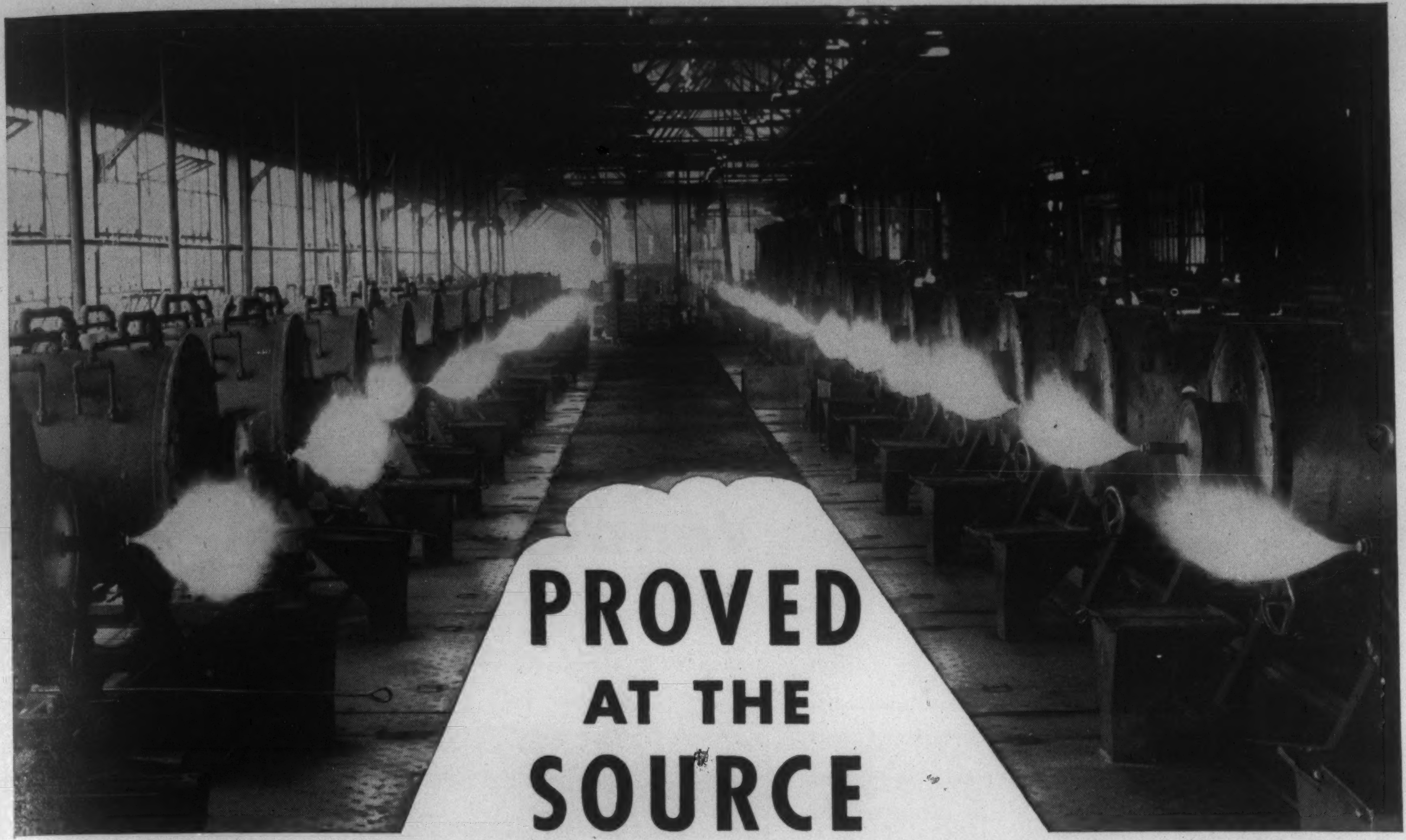
Here is a practical, easily-manipulated microscope that will enable you to make analyses of your metal grain structures with sufficient accuracy for all routine control and ordinary research work. And it's very reasonable, too. With all the necessary optical accessories, it costs less than $200!

This simple microscope is suitable for both low and high power magnifications. It has a permanently aligned light source and not only an aperture iris to regulate light intensity but also an iris diaphragm to limit the field of view. Thus, perfect control of the illumination system is possible.

E. LEITZ, Inc.

730 Fifth Ave., New York, N. Y.
Detroit Washington Chicago

Western Agents:
Spindler & Sauppe, Inc.
Los Angeles - San Francisco



GOOD WILL
BASED ON
GOOD STEEL

The extensive carburizing and heat treating experience gained in the manufacture of TIMKEN Bearings is one important reason for the superiority of TIMKEN Carburizing Steels.

With one of the largest and most modern carburizing and heat treating plants in the world to draw upon for practical information, research and testing, Timken metallurgists and steel makers are able to eliminate uncertainties and produce steels that respond to modern processes accurately and uniformly.

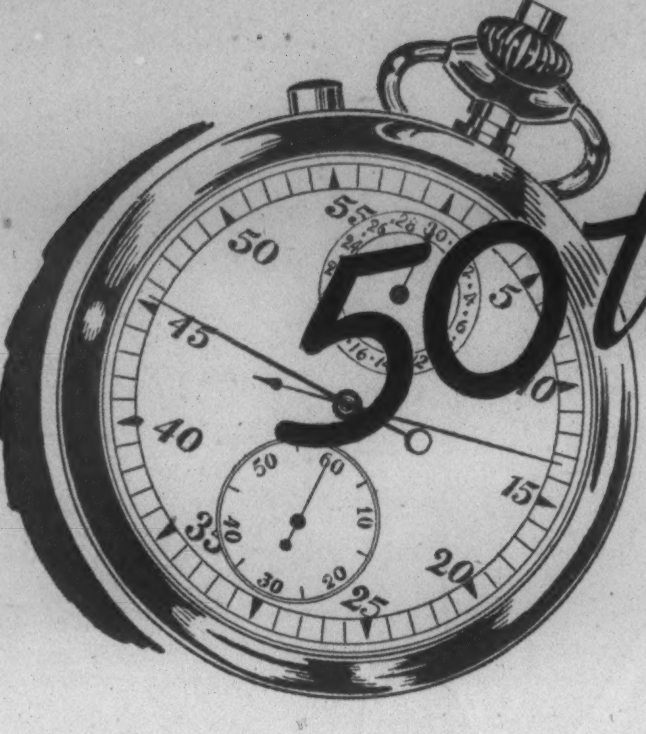
Furthermore, it enables Timken technical men to recommend the right type of carburizing steel for any particular job and also to tell the steel user authoritatively and exactly how the steel should be handled to obtain the best results. If you use carburizing steel it will pay you to use TIMKEN Steel.

TIMKEN Alloy and Carbon Steel Seamless Tubes for all mechanical and high temperature purposes.

TIMKEN STEEL AND TUBE DIVISION
THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; Timken Rock Bits; and Timken Fuel Injection Equipment.

TIMKEN
ALLOY STEELS



50 times a minute

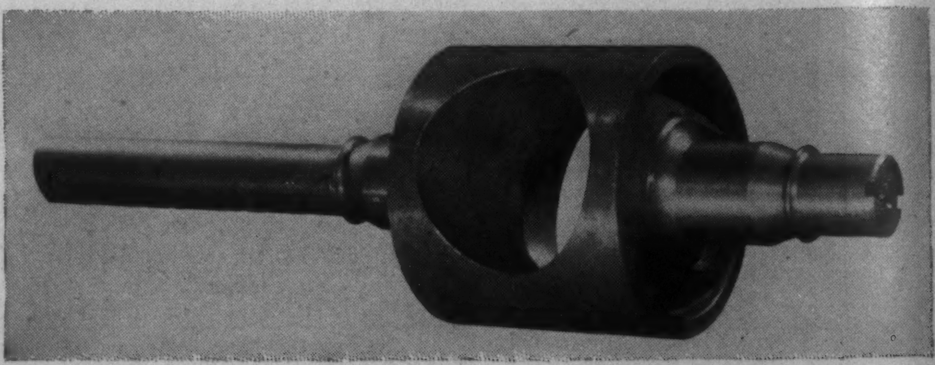
A Slug of Concrete is Forced Through a Vanadium Steel Valve

Of the thousands of applications in which Vanadium Steels are meeting unusual conditions, few installations approach the severity of service to which Vanadium Steel valve plugs and Vanadium Steel valve chambers are subjected in the Rex Pumpcrete.

50 times a minute the Vanadium Cast Steel valve of the Rex Pumpcrete opens and closes by a 90 degree turn of the Vanadium Cast Steel valve plug. 50 times a minute a slug of concrete, with its highly abrasive action, is forced through the valve. 25 to 27 tons of concrete go through the valve every hour. Tough service . . . but Vanadium Steel Castings in vital parts have helped Pumpcrete to outstanding records in pumping over four and one-half million yards of concrete.

If you have a tough job for a casting, forging or rolled part, remember the great strength, shock-resisting qualities and dependability of Vanadium Steels. Metallurgists of the Vanadium Corporation of America will be glad to study your problem with you.

Rex Pumpcrete, first machine to pump concrete in America, made by Chain Belt Company, Milwaukee. Vital parts of the Pumpcrete, notably Valve Plugs and Valve Chambers, are Vanadium Cast Steel, furnished by Sivyer Steel Castings Company, Milwaukee.



VANADIUM CORPORATION OF AMERICA
420 LEXINGTON AVENUE, NEW YORK, N. Y.
Plants at Bridgeville, Pa., and Niagara Falls, N.Y.
Research and Development Laboratories, Bridgeville, Pa.

Vanadium Steels

METALS VANCORAM ALLOYS

FERRO ALLOYS
of vanadium, silicon, chromium, and titanium, produced by the Vanadium Corporation of America, are used by steel makers in the production of high-quality steels.

FOR STRENGTH · TOUGHNESS · DURABILITY

METALS *and* ALLOYS

DEC
1937
NUMBER
12

THE MAGAZINE OF METALLURGICAL ENGINEERING

"Liquid ATMOSPHERES"

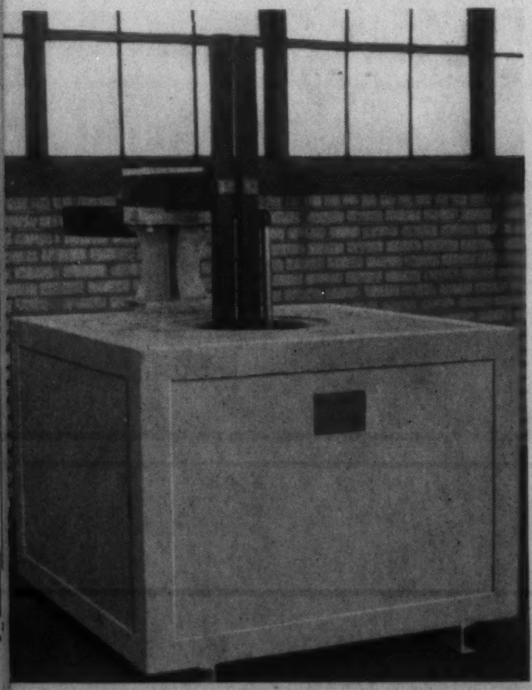
PREFERRED for the Heat Treatment of Modern Steels!

In these days of great emphasis on "controlled" atmospheres in heat treating, Houghton offers proof that liquid salt baths offer the most advantages from a control and result viewpoint.

Salts are lower in cost . . . furnish a quicker and more uniform medium of heat transfer . . . reduce distortions . . . provide an easily controlled accuracy of temperature . . . will not attack surfaces.

Reasons-Why are set forth in a booklet just released, which every heat treater should have for his reference.

Houghton provides proven salts for all processes—including carburizing (PERLITON), reheating, hardening, tempering and high speed steel treatment. These, with the attendant plant service afforded by our Metal Research Staff, are as near as your telephone.



A card to 240 W. Somerset St., Philadelphia, will bring you the new booklet—"Liquid Salt Baths"

E. F. HOUGHTON & CO.

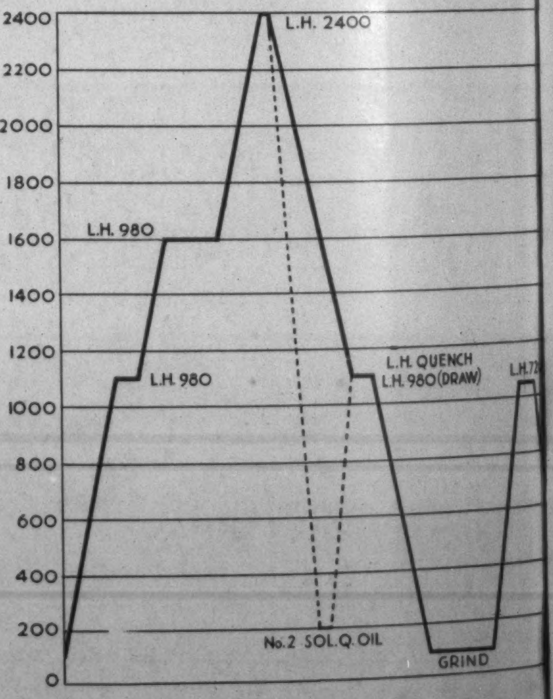
CHICAGO — PHILADELPHIA — DETROIT

HIGH SPEED STEEL

(Left) Ajax Hultgren furnace, described on back cover of this issue. Houghton's Liquid Heat 2400 (Patented) is the most efficient medium for hardening high speed steels at the high heats without blistering, as obtainable in this furnace.

CHARTING

The cycle of high speed steel treatment depicted at the right is a recommended procedure based on Houghton Research experience and advice, upon which heat treaters have long relied.



HOUGHTON'S *Liquid Heats*

Booth E – 32

NATIONAL METAL SHOW AT ATLANTIC CITY

OCTOBER 18-22

See an interesting and informative display of J & L Steel Products

To get helpful information on the right quality of steel for your applications . . . to improve your production and better the quality of your products . . . visit the J&L Exhibit. Attending J&L Metallurgists will be available to consult with you on your more important steel problems and give you helpful suggestions on the application of J&L Steel in your manufacturing operations.

On display will be highly interesting and informative exhibits covering a wide variety of parts made of J&L Jalcase Steel, J&L *Improved* Bessemer Screw Stock, J&L Cold Finished Steel, J&L Forging Steel, J&L Cold Heading Wire, J&L Standard Spring Wire, and containers and closures made of J&L Coke Tin Plate.

These parts are of both intricate and unusual design and give evidence of the advantages of using J&L Steel. Of particular interest will be the display featuring finished parts formed of strip and sheet products rolled on the new J&L 96-inch Continuous Strip Mill.

Visit the J&L Exhibit . . . Booth E-32 . . . and learn how J&L Steel speeds up production . . . cuts down costs and helps to bring you greater sales and profits. Standardize on J&L Steel for all your needs.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PENNSYLVANIA
MAKERS OF HIGH QUALITY IRON AND STEEL PRODUCTS SINCE 1850

GALVANIZED ROOFING AND SIDING · COLD FINISHED BARS AND SHAPES · WIRE RODS AND WIRE PRODUCTS · SEAMLESS & WELDED TUBULAR PRODUCTS · TIN PLATE, BLACK SHEETS AND MANUFACTURING TERNES · FABRICATED STRUCTURAL WORK · COKE BY-PRODUCTS

A.S.M.

TECHNICAL PROGRAM OF THE AMERICAN SOCIETY FOR METALS

E. C. Bain
President

An outstanding feature of the National Metal Congress is always the technical program of the American Society for Metals. And this is true this year. The tentative program consists of over 50 technical papers and lectures which deal with practically every phase of metallurgical engineering and of the whole metal industry.

The headquarters of the A. S. M. is the Ambassador Hotel. Papers scheduled for mornings will be delivered at the Hotel and the afternoon program will be presented in suitable rooms in the Auditorium.

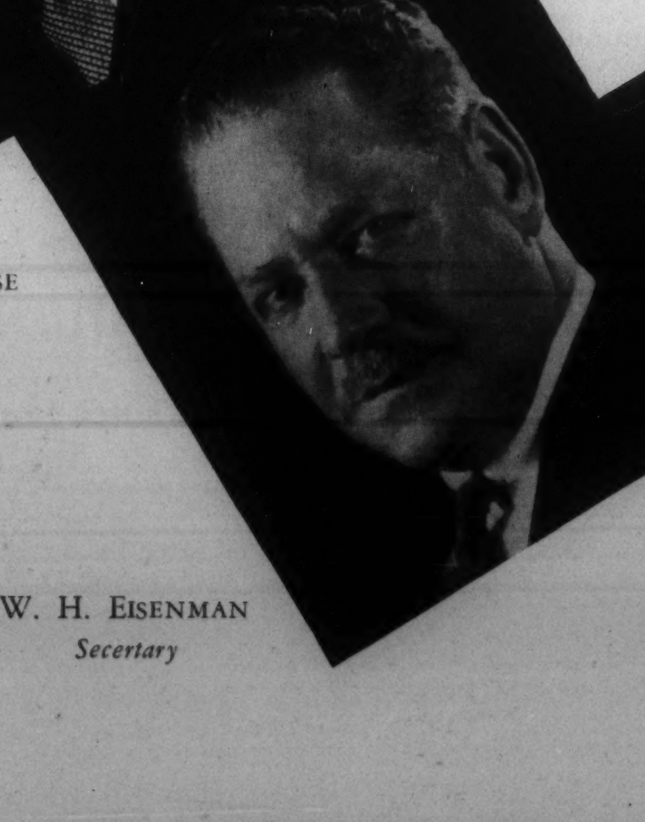
Two courses of special lectures have been arranged for, continuing a custom which originated about three years ago. In 1935 Dr. M. A. Grossman presented a series on "Heat Treatment of Steel" and E. J. Martin one on "Spectrographic Analysis." Last year the two lecturers were Prof. H. D. Churchill on "Physical Testing of Metals" and Dr. Kent R. Van Horn on "X-Ray Analysis." This year the lectures consist of a course on "Steel Making" by Earnshaw Cook, American Brake Shoe & Foundry Co., Mahwah, N. J., and one on "Metallographic Technique" by J. R. Vilella, United States Steel Corp. Research Laboratory, Kearny, N. J.

In carrying out such a large technical program, simultaneous sessions have had to be scheduled for several of the days.

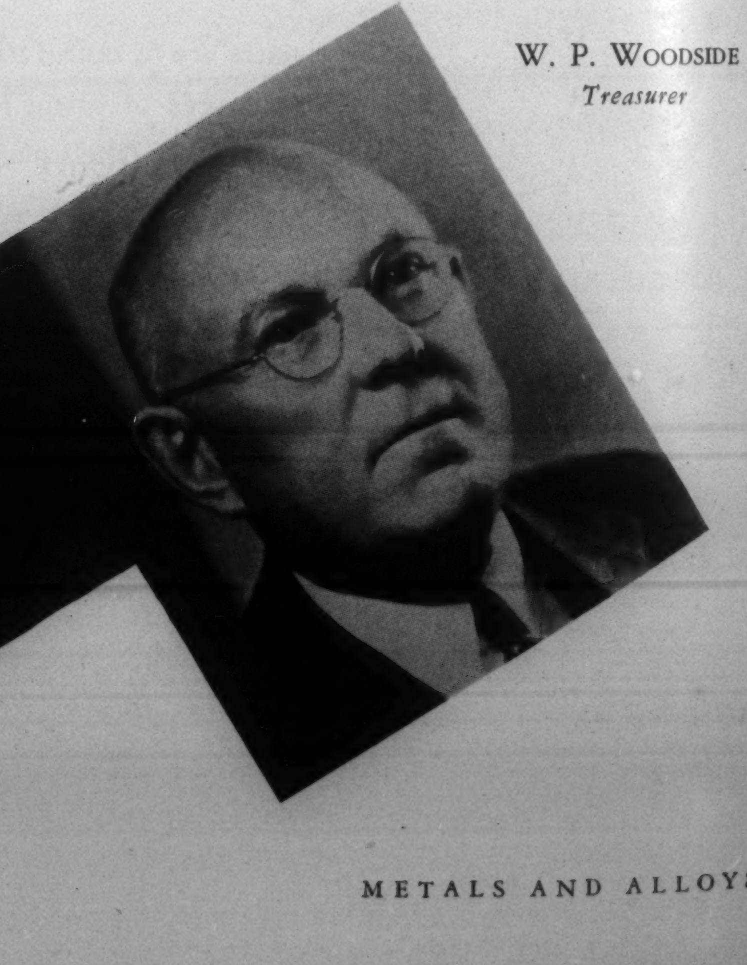
The Campbell Memorial Lecture, always a special event, will be delivered by W. P. Sykes, General Electric Co., Cleveland.

The technical program is substantially as follows:

G. B. Waterhouse
Vice President



W. H. Eisenman
Secertary



W. P. Woodside
Treasurer

MONDAY, OCTOBER 18

MORNING SESSION

Ambassador Hotel

10:00 A.M. —"*The Process of Dry Cyaniding,* R. J. Cowan and J. T. Bryce, Surface Combustion Corp., Toledo, Ohio.

10:40 A.M. —"*The Mechanism of Steel Hardening and Tempering as Indicated by Coercive Force Measurements,*" R. S. Dean, Bureau of Mines, Washington, and C. Y. Clayton, Missouri School of Mines and Metallurgy, Rolla, Mo.

11:20 A.M. —"*Effect of Tempering Quenched Hypereutectoid Steels on the Physical Properties and Microstructure,*" C. R. Austin and B. S. Norris, Pennsylvania State College, State College, Pa.

AFTERNOON SESSION

Auditorium Ball Room

2:00 P.M. —"*Effect of Carbon on the Hardenability of High Purity Iron-Carbon Alloys,*" T. G. Digges, National Bureau of Standards, Washington.

2:40 P.M. —"*Precipitation-Hardening of Cobalt Steel: A New Tool Material,*" R. H. Harrington, General Electric Co., Schenectady, N. Y.

3:20 P.M. —"*Quantitative Hardenability,*" J. L. Burns, T. L. Moore and R. S. Archer, Republic Steel Corp., Chicago.

Simultaneous Session

Auditorium—Room B

2:00 P.M. —"*A Note on Rapid Photomicrography,*" W. Mutchler and H. O. Willier, National Bureau of Standards, Washington.

2:40 P.M. —"*The Effect of Grain Size on the Oxidation of a Low Carbon Steel,*" C. A. Siebert and Clair Upthegrove, University of Michigan, Ann Arbor, Mich.

3:20 P.M. —"*Electromagnetic Measurements and Steel Structures Correlated,*" Carl Kinsley, Consulting Engineer, New York City.

Auditorium

Educational Lectures

4:30 P.M. —"*Steel Making,* Earnshaw Cook, American Brake Shoe & Foundry Co., Mahwah, N. J.

8:00 P.M. —"*Metallographic Technique,* J. R. Vilella, United States Steel Corp., Kearny, N. J.

TUESDAY, OCTOBER 19

MORNING SESSION

Ambassador Hotel

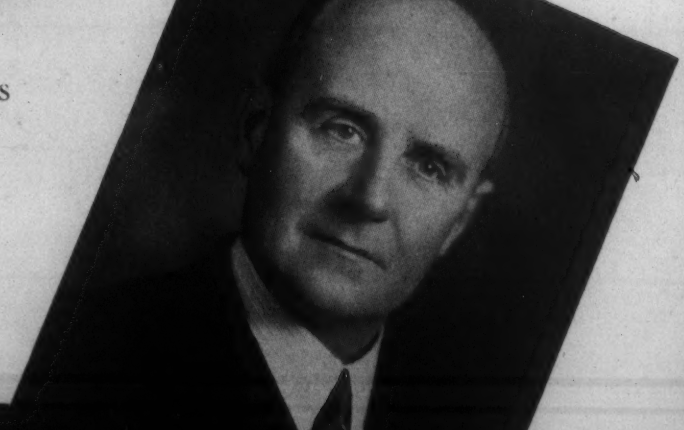
10:00 A.M. —"*The Rupture Strength of Steels at Elevated Temperatures,*" A. E. White and C. L. Clark, University of Michigan, Ann Arbor, Mich., and R. L. Wilson, Timken Roller Bearing Co., Canton, Ohio.

(Continued on page P 86)

R. S. Archer
Trustee

R. L. Wilson
Trustee

S. C. Spalding
Trustee



O. W. Ellis
Trustee

R. L. Kenyon
Trustee

Checking and Double-Checking HEAT

Inspecting the production of customer's samples in the roller-hearth furnace which is part of the regular equipment in the new laboratory

New Industrial Heating Laboratory—backed by 20 years of experience

Electric-furnace brazing

Continuous annealing of steel strip

Annealing brass strip

G E N E R A L

TREATING RESULTS on YOUR PRODUCTS

WE CHECK the heat-treating of your product by testing your own samples in the furnaces of our new Industrial Heating Laboratory so that you can see which type of furnace gives the results you want. We double-check by testing the equipment you may then order from us to be sure that it will give you long, satisfactory operation.

In addition, in this Laboratory will be concentrated new resources for research and development in electric heat-treatment.

Hence, when you buy a General Electric furnace, you actually get an outstandingly fine furnace, PLUS testing of your samples in our laboratory, PLUS testing of any equipment we build for you, PLUS 20 years of General Electric experience with electric furnaces, PLUS the advantages from future developments—developments which, although made in our laboratory, benefit you by continually offering you opportunities to improve your products and reduce your costs.

The Industrial Heating Laboratory, like all the rest of General Electric's immense facilities for research, works for you. For every dollar research has earned for General Electric, it has saved ten to one hundred dollars for G-E customers.

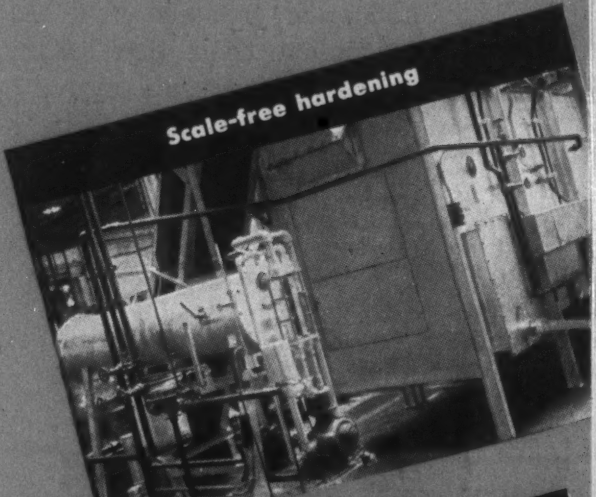
You can have the complete benefit of this service, experience, and saving. Consider General Electric the next time you plan to buy heat-treating equipment. General Electric, Schenectady, New York.

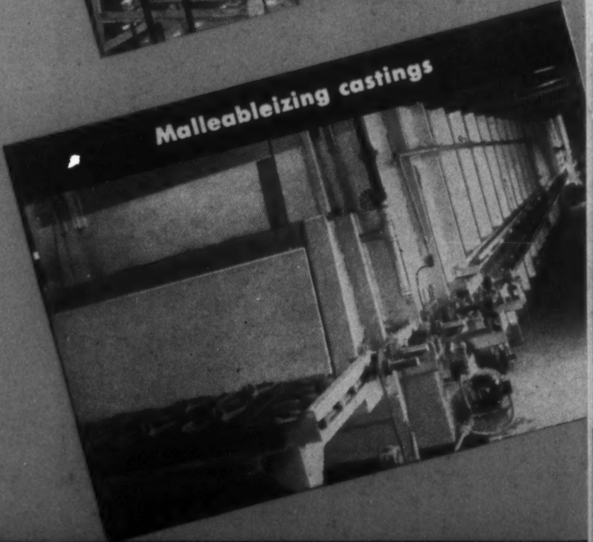
SEE Scale-free Hardening at National Metals Exposition

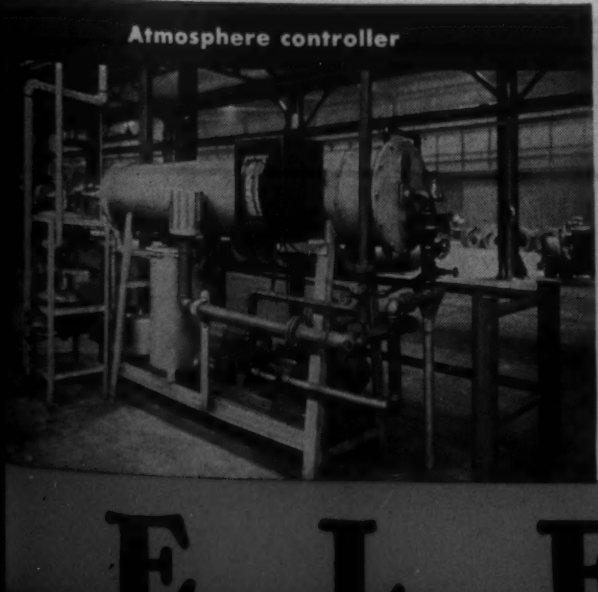
Scale-free hardening, and drawing of the hardened parts, will be presented under actual production conditions as a part of the General Electric exhibit at the National Metals Exposition at Atlantic City, Oct. 16–22. Visit Booth A-33 and let us show you the latest equipment for these processes. Use the high quality of the scale-free-hardened parts you see as your standard in selecting heat-treating equipment.

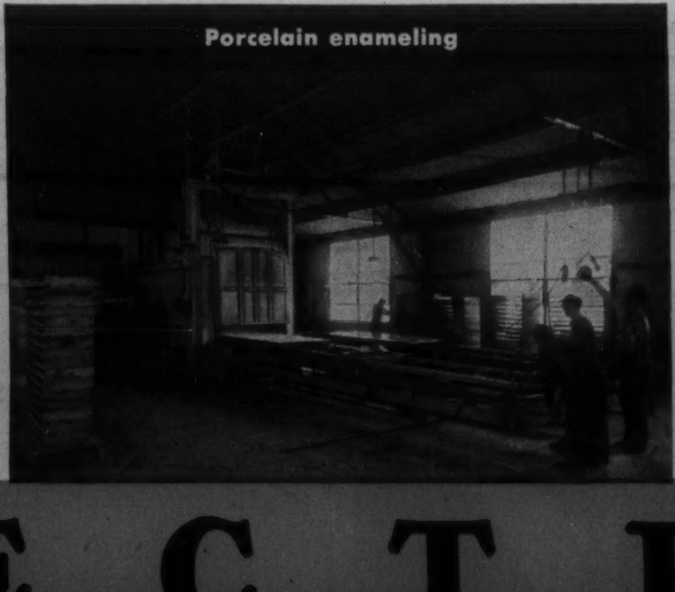
ALL TYPES OF ELECTRIC FURNACES FROM ONE MANUFACTURER

General Electric builds electric furnaces and equipment for supplying protective atmospheres for all sorts of work. Whether your requirements involve large or small production, whether ferrous or nonferrous metals, whether hardening, drawing, annealing, brazing, or porcelain-enameling—whatever your needs, they can be met by General Electric. Use electric heat and give your products the added value of higher quality.


Scale-free hardening


Malleableizing castings


Atmosphere controller


Porcelain enameling

Tool-tempering oven

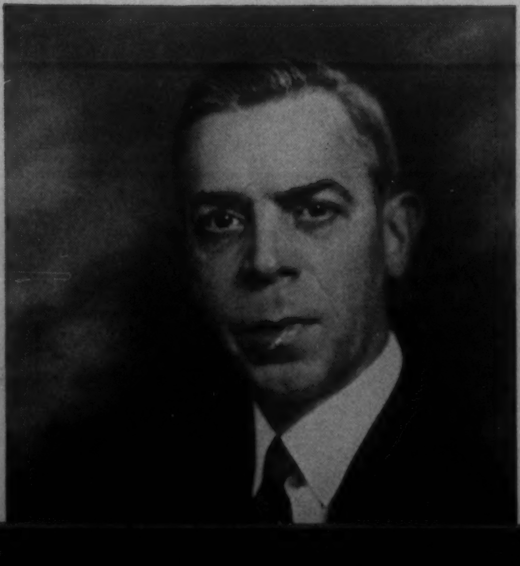
ELECTRIC

AWS
TECHNICAL PROGRAM OF THE AMERICAN WELDING·SOCIETY

The eighteenth annual meeting of the American Welding Society, held in conjunction with the National Metal Congress, will have as its headquarters the Traymore Hotel. A technical program of broad interest has been prepared under the guidance of C. A. McCune, chairman of the convention committee. Many important phases of the welding industry are covered by the papers and by authors of reputation—Fundamental Research in Welding, Fabrication, Shipbuilding and so on. A symposium on alloy steels is scheduled for one session and a joint meeting with A. S. M. E. is another feature.

The technical program for the sessions is as follows in substance:

A. E. Gibson
President



C. A. McCune
Chairman Convention Committee

SUNDAY, OCTOBER 17th

5 to 7 P.M. *Birdseye View of Boardwalk and Island Stratosphere Room, Hotel Traymore.*

Informal President's Reception to members and their ladies. A chance to meet the Past-Presidents, Committeemen and all the welding folks.

MONDAY, OCTOBER 18th

9:30 A.M. Opening Session

Senior Vice-President, E. R. Fish, *presiding*

Announcements.

Greetings by Convention Committee Chairman C. A. McCune.

Address and Report of President Gibson.

Business Session

President A. E. Gibson, *presiding*

Welding Research Activities by C. A. Adams.
Status of Progress by Committee Chairmen.
Award of Samuel Wylie Miller Memorial Medal *"for meritorious achievement contributing conspicuously to the advancement of the art of welding and cutting."*
Award of Lincoln Medal, *"for best paper of year in Welding Journal."*
Progress Report by Managing Director.
Review of Section Activities by Regional Vice-Presidents and Section Chairmen or Representatives.
Tellers' Report on Election of Officers.
Award of Past-President's pin.

Looking Ahead with the American Welding Society—President Elect Lang.

12:00 Noon Opening Metals Exposition—Convention Hall

2:00 P.M. Technical Session

G. F. Jenks, *Chairman,* Col. Ord. Dept., U. S. Army.

E. Vom Steeg, *Vice-Chairman,* General Electric Company.

Industrial Research

Weldability of Low Alloy Steels, by W. L. Warner, Watertown Arsenal.

The Spot Welding Characteristics of Some Copper Base Alloys, by D. K. Crampton and J. J. Vreeland, Chase Brass & Copper Company.

Survey of Low-Alloy Steels as to Weldability, by J. H. Critchett, Union Carbide & Carbon Res. Laboratories.

Physical Properties and Corrosion Resistance of Nickel-Iron Alloys Formed in the Welding of Nickel-Clad Steel, by J. H. Deppeler, W. G. Thiesinger and F. G. Flocke.

X-ray Methods of Studying Stress Relief in Welds, by J. T. Norton, Mass. Institute of Technology.

6:30 P.M. Board of Directors' Meeting

Dinner followed by meeting.

Review of Society activities, appointment of committees and officers.

New Business.

10:30 P.M. Exposition Closes for the Day

TUESDAY, OCTOBER 19th

9:30 A.M. Technical Session

Everett Chapman, *Chairman*, Lukenweld, Inc.
Otto H. Henry, *Vice-Chairman*, Polytechnic Institute of Brooklyn.

Fundamental Research in Welding

Fatigue Tests of Butt Welds in Plates, by W. M. Wilson, University of Illinois.
The Heat Effect in Welding, by W. H. Bruckner, U. S. Naval Research Laboratory.
The Electric Industry and the Welding Industry, by A. S. Douglass, The Detroit Edison Company.

12:00 Noon Metal Exposition—Convention Hall

2:00 P.M. Technical Session

T. M. Jackson, *Chairman*, Sun Shipbuilding & Dry Dock Company.
J. H. Zimmerman, *Vice-Chairman*, The Linde Air Products Company.

Fundamental Research in Welding

Welded Girders with Inclined Stiffeners, by Cyril D. Jensen and Wm. F. Lotz, Jr., Lehigh University.
Welding of Copper, by A. P. Young, Michigan College of Mining & Technology.
Static and Impact Tensile Properties of Stainless Steel Welds at Ordinary and Low Temperatures, by O. H. Henry, Polytechnic Institute of Brooklyn.
Effect of Welded Top Angles on Beam-Column Connections, by Inge Lyse and G. J. Gibson, Lehigh University.
High-Speed Motion Pictures of Flame Cutting, by H. R. Bullock, Mass. Institute of Technology.

Joint Session With American Society of Mechanical Engineers

2:00 P.M. Technical Session

G. F. Nordenholt, *Chairman*, Product Engineering.
J. W. Sheffer, *Vice-Chairman*, American Car & Foundry Company.
Resistance Welding Fabrication, by J. M. Cooper, General Electric Company.
Developments in Large Welded Structures, by C. C. Brinton, Westinghouse Electric & Mfg. Co.
Recent Developments in Fusion Welding, by C. W. Obert, Union Carbide & Carbon Res. Labs.

7:30 P.M. Conference and Meeting of Fundamental Research Committee

H. M. Hobart, *Chairman*, General Electric Company.
This conference is scheduled for university research workers in the fundamentals of welding.

10:30 P.M. Exposition Closes for the Day

WEDNESDAY, OCTOBER 20th

9:30 A.M. Technical Session

H. C. Boardman, *Chairman*, Chicago Bridge & Iron Works.
E. V. David, *Vice-chairman*, Air Reduction sales Company.

Fabrication

Carbon Arc Welding in Automotive Work, by William Richards, Chevrolet Motor Co.
Automatic Resistance Welding, by Harry Landstrom, Nash-Kelvinator Corp.
Welding—An Aid in Dam Construction, by T. B. Jefferson, Engineer-in-Charge of Eng. Shops, U. S. Engineer Department.
Oxy-Acetylene Welding as a Production Tool, by A. Bell, Engr., Heywood-Wakefield Co.

12:00 Noon Exposition Opens for the Day

12:30 P.M. Luncheon Conference

Officers and Members Executive Committees of Sections and Divisional Vice-Presidents of Society.

THURSDAY, OCTOBER 21st

9:30 A.M. Technical Session

W. M. Mitchell, *Chairman*, Carnegie Illinois Steel Co.
J. J. Crowe, *Vice-Chairman*, Air Reduction Sales Company.

Symposium on Alloy Steels

Resistance Welding of Low Alloy Steels, by G. S. Mikhalapov, Heintz Manufacturing Company.
Low Alloy Steels, by A. B. Kinzel, Union Carbide & Carbon Res. Labs.
Stainless as Applied to Pressure Vessels, by J. C. Holmberg, Struthers-Wells-Titusville Corp.

12:00 Noon Metal Exposition—Convention Hall

2:00 P.M. Technical Session

Charles I. MacGuffie, *Chairman*, General Electric Company.
Milton Male, *Vice-Chairman*, U. S. Steel Corp.

Shipbuilding

Welding in Building Tanker Vessels, by T. M. Jackson, Sun Shipbuilding & Dry Dock Co.
Assembly Plant for the Welding of Barges, by Geo. F. Wolfe, Dravo Corporation.
Tests and Arc Welding in Ship Structure, by Lieut. Commdr. W. P. Roop, U. S. Navy.
All-Welded Steel Tankers, by A. C. Leigh, The Ingalls Iron Works Co.

6:00 P.M. Exposition Closes for the Day

EVENING

7:00 P.M. Dinner Dance and Entertainment

FRIDAY, OCTOBER 22nd

9:00 A.M. Metal Exposition—Convention Hall

9:30 A.M. Technical Session

P. G. Lang, Jr., *Chairman*, The Baltimore and Ohio Railroad Company.
A. F. Davis, *Vice-Chairman*, The Lincoln Electric Company.

Railroad Session

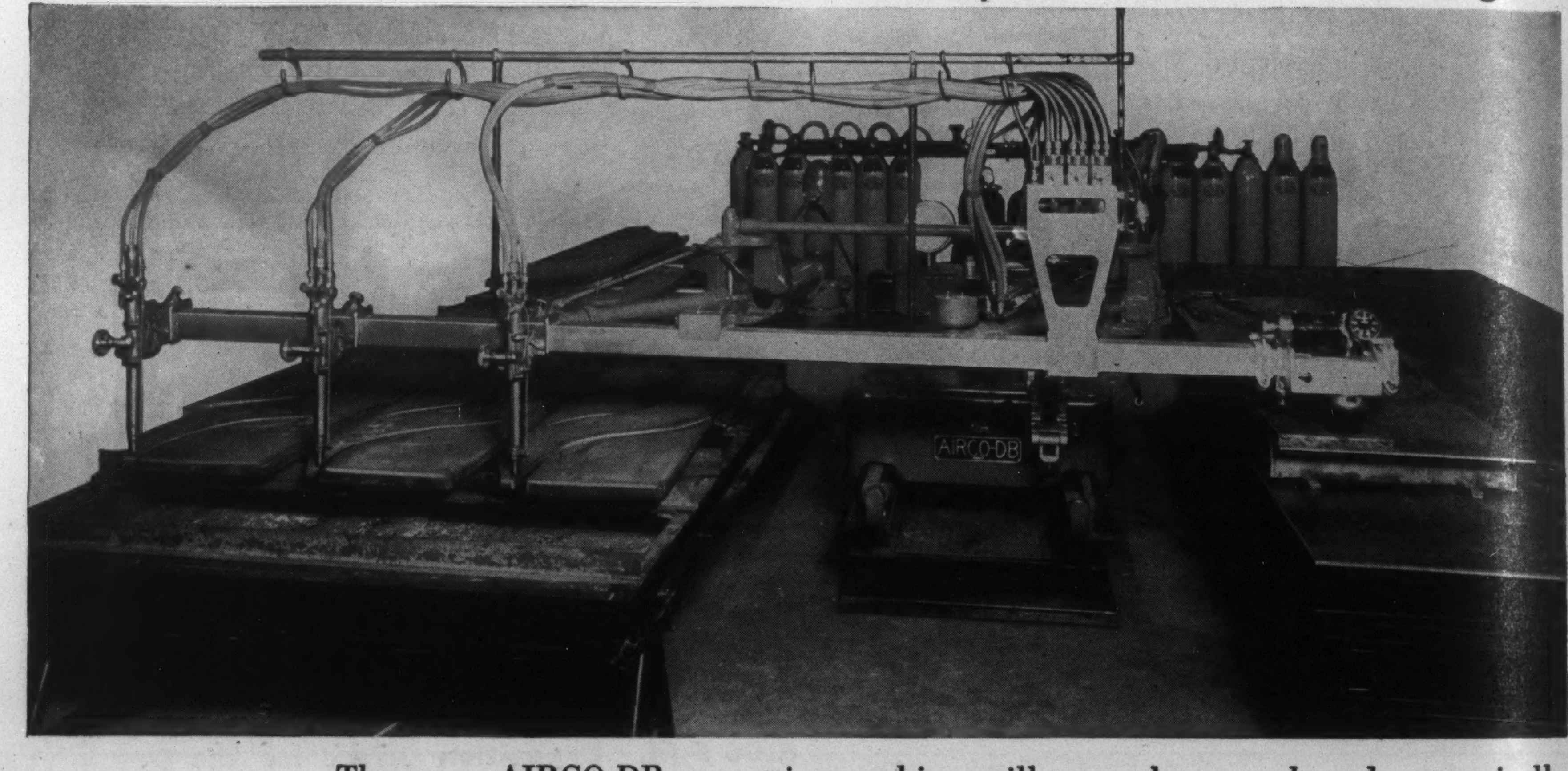
Building Up Locomotive Driving Boxes, by I. T. Bennett, Revere Copper & Brass, Inc.
Machine Gas Mechanical Cutting in Railroad Work, by H. Bass, New York Central Railroad.
Welding of Railroad Rolling Stock, by V. R. Willoughby, American Car and Foundry Co.

NEW

See these machines at the Nationa

The AIRCO-DB TRAVOGRAPHS

Broadening the range of Multiple Flame Cutting



These new AIRCO-DB gas cutting machines will cut steel accurately and economically over a cutting area of 120 inches wide by 13 feet long. The length can be increased indefinitely by the use of additional track. A mechanically operated magnetic tracer —*an exclusive AIRCO feature*—guides the bar upon which the torches are mounted, cutting duplicate parts with speed and accuracy. Other guiding devices for template or manual operation can also be supplied.

As with the AIRCO-DB No. 6 Oxygraph, these machines make multiple torch cutting a *practical* operation.

Another triumph for AIRCO engineering skill—another opportunity to reduce costs in production of parts gas cut from steel.

Be sure to visit the AIRCO exhibit at Atlantic City where these and other AIRCO-DB gas cutting machines will be operating on standard production work.

AIR REDUCTION SALES COMPANY

General Office: 60 East 42nd St., New York City

DISTRICT OFFICES and DISTRIBUTING STATIONS in PRINCIPAL CITIES

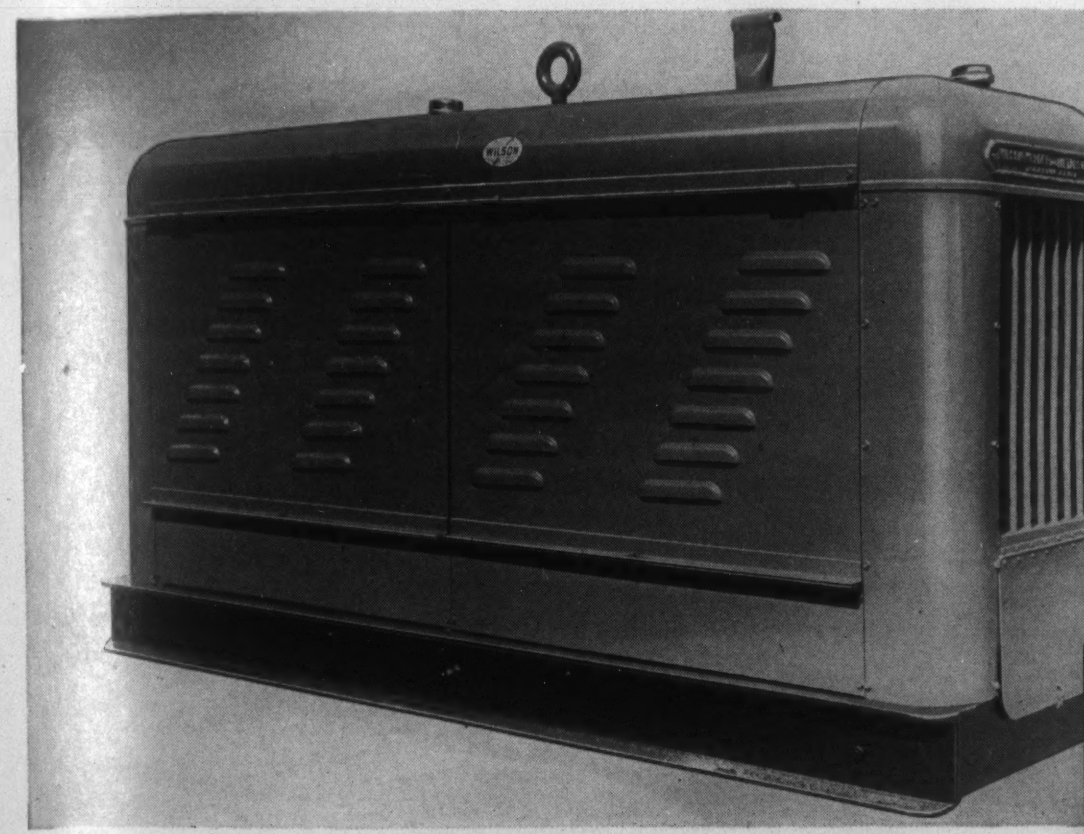
AIRCO THE NAT

for Anything and Every

na etal Show—Atlantic City, Oct. 18-22

NEW

The **WILSON**
"YELLOW JACKET"
It simplifies
Electric Arc Welding



Specifically designed and developed to meet the difficult conditions often encountered in PIPE LINE welding. Important features include: light weight—rigid strength—low center of gravity—improved automatic idling device—large gasoline tank—close coupling of drive and generator. Many other features covered in the complete catalog—on request. You can depend upon it to get sound welds at rock bottom cost from start to finish of the job. Requires fewer time-consuming interruptions for adjusting circuit voltages. The "YELLOW JACKET" will be on display in our exhibit at the Metal Show, with other members of the WILSON WELDER line which meets and *satisfies* every arc welding need.

WILSON WELDER & METALS COMPANY, INC.

General Office: 60 East 42nd St., New York City · Distributed through AIR REDUCTION SALES COMPANY

TION-WIDE SUPPLY SERVICE

ery thing needed in FLAME CUTTING *and* WELDING *by* GAS *or* ELECTRIC ARC

TECHNICAL PROGRAM OF THE
TWO METAL DIVISIONS OF THE

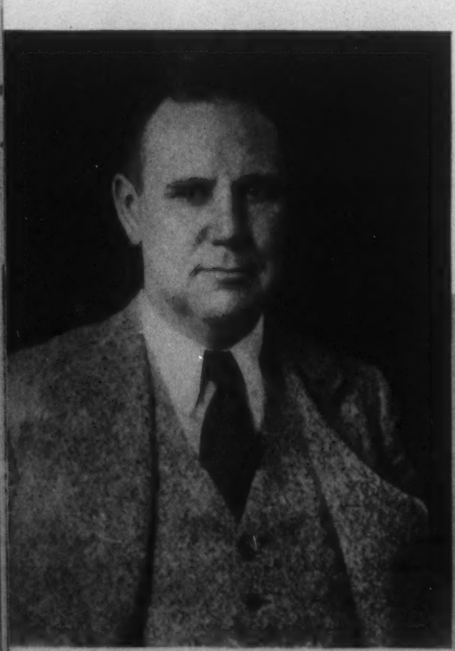
MINING AND METALLURGICAL ENGINEERS

An excellent and varied technical program has been prepared for the two divisions of the A. I. M. and M. E.—The Iron and Steel and the Institute of Metals divisions—for participation in the National Metal Congress. The Ritz-Carlton Hotel has been selected as the headquarters where all activities will be centered.

A feature of the program is a series of sessions and meetings on the Physics of Metals early in the week. This series includes a science lecture on "The Behavior of Gases at Metal Surfaces" by Arthur F. Benton of the University of Virginia.

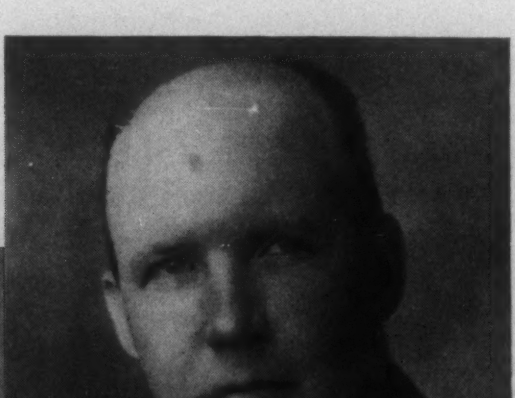
At the customary dinner of the two divisions, joined this year by the machine shop practice division of the A.S.M.E., the speaker will be Harvey N. Davis, president of Stevens Institute of Technology, on "The Place of the Engineer in Modern Life."

The tentative technical program follows:



R. C. Allen
President A.I.M.M.E.

A. B. Parsons
Secretary A.I.M.M.E.



F B. Foley
Chairman, Iron and Steel Division

A. J. Phillips
Chairman, Institute of Metals

MONDAY, OCTOBER 18

10:00 A.M. TO 5:00 P.M. *Registration—Lounge, 3rd Floor, Ritz-Carlton Hotel.*

8:00 P.M. *Physics of Metals Round Table—Exposition Auditorium, Room B:* Sponsored jointly by Institute of Metals and Iron and Steel Divisions, A. I. M. E., A. S. M., A. S. T. M., and the American Institute of Physics.

Subject—Elasticity

Technical Chairman—L. W. McKeehan, Sloane Physics Laboratory, Yale University.

True Stress Strain Curves

(a) for single crystals.

Discussion leader: S. L. Hoyt, A. O. Smith Corporation

(b) for polycrystalline materials.

Discussion leader: R. K. Haskell, Watertown Arsenal.

Internal Dissipation of Energy in Metals for Small Cyclic Strains.

Discussion leader: R. L. Wegel, Bell Telephone Laboratories.

TUESDAY, OCTOBER 19

10:00 A.M. *Joint Session, Institute of Metals Division and Iron and Steel Division—Trellis Room, Ritz-Carlton Hotel*

Physics of Metals

"A Theory of Diffusion in Solids," by John E. Dorn and Oscar E. Harder, Battelle Memorial Institute.

"Some Fundamentals Concerning Impact Testing," by Earl B. Smith, College of the City of New York.

"The Problem of the Temperature Coefficient of Tensile Creep Rate," by J. J. Kanter, Crane Co.

2:00 P. M. *Science Lecture of the Metals Division—Trellis Room, Ritz-Carlton Hotel.*

Chairmen: Albert J. Phillips, Institute of Metals Division; Francis B. Foley, Iron and Steel Division.

"The Behavior of Gases at Metal Surfaces," by Arthur F. Benton, School of Chemistry, University of Virginia.

WEDNESDAY, OCTOBER 20

12:15 P.M. Luncheon Meeting, Executive Committee, Iron and Steel Division—Loggia Room, Ritz-Carlton Hotel.

2:00 P.M. *Joint Session Institute of Metals Division and Iron and Steel Division Trellis Room, Ritz-Carlton Hotel.*

"Diffusion of Carbon from Steel Into Iron," by L. C. Grimshaw, Duo Metals Division, Latrobe Electric Steel Co.

"Investigations on Pb-Mg Alloys for the Prevention of Lead Poisoning in Waterfowl," by R. L. Dowdell and R. G. Green, University of Minnesota.

"The Effect of Cr on the Grain Growth of Brass," by B. W. Gonser and C. M. Heath, Battelle Memorial Institute.

7:00 P.M. *Main Dining-Room, Ritz Carlton Hotel.*

Dinner Institute of Metals and Iron and Steel Divisions, A. I. M. E.; joined by Machine Shop Practice Division, A. S. M. E., Ritz-Carlton Hotel.

Dinner speaker, Harvey N. Davis, President of Stevens Institute of Technology; subject, "The Place of the Engineer in Modern Life."

THURSDAY, OCTOBER 21

10:00 A.M. *Iron and Steel Division—Trellis Room, Ritz-Carlton Hotel.*

"Effect of Silicon on Steels for High-temperature Service," by H. D. Newell, Babcock & Wilcox Tube Co

"Notes on Microstructures and Hardness of Alloys Consisting Essentially of Iron, Chromium and Silicon," by A. G. H. Andersen, Phelps Dodge Corporation, and Eric R. Jette, Columbia University.

"An X-ray Study of the Effects of Adding Carbon, Nickel, or Manganese to Some Ternary Iron-chromium-silicon Alloys," by Eric R. Jette, Columbia University, and A. G. H. Andersen, Phelps Dodge Corporation.

10:00 A.M. *Institute of Metals Division—Main Dining-Room, Ritz-Carlton Hotel.*

"Age Hardening of Aluminum Alloys, III—Double Hardness Peaks," by W. L. Fink and D. W. Smith, Aluminum Co. of America.

"Use of Tellurium in Copper-base Alloys," by H. L. Burghoff and D. E. Lawson, Chase Brass & Copper Co.

"Sulphur, Selenium and Tellurium in Copper-base Alloys," by Cyril S. Smith, American Brass Co.

12:15 P.M. *Luncheon Meeting, Executive Committee, Institute of Metals Division—Loggia Room, Ritz-Carlton Hotel.*

12:15 P.M. *Luncheon Meeting, Open-hearth Executive Committee—Dining Terrace, Ritz-Carlton Hotel.*

2:00 P.M. *Open-hearth Committee, Iron and Steel Divi-Division—Trellis Room, Ritz-Carlton Hotel.*

Open Hearth Steel Practice

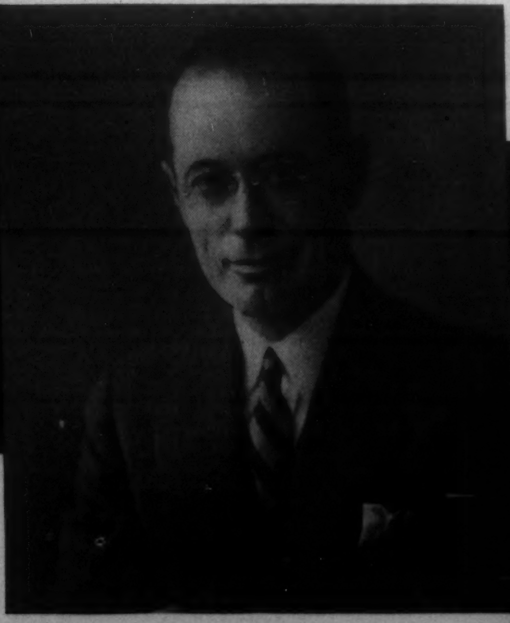
"Extensive Control Features Open Hearth Practice at Lackawanna," by P. F. Kinyoun, Bethlehem Steel Co.

"Basic Open Hearth Slag Control by the Use of the Viscosimeter," by W. J. Reagan, Edgewater Steel Co.

"Combined Carbon; The Controlling Factor in Quality of Basic Pig Iron," by Ralph H. Sweetser, Stuart, James & Cooke, Inc.

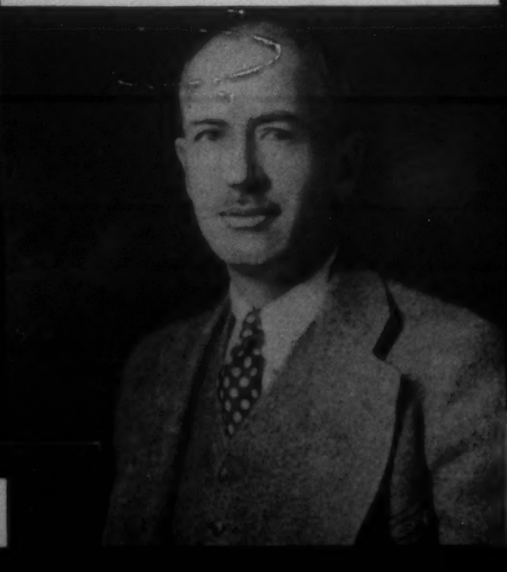
"Progress Report on the Use of Venturi Ports in Open-hearth Furnaces," by George L. Danforth, Jr., Open Hearth Combustion Co.

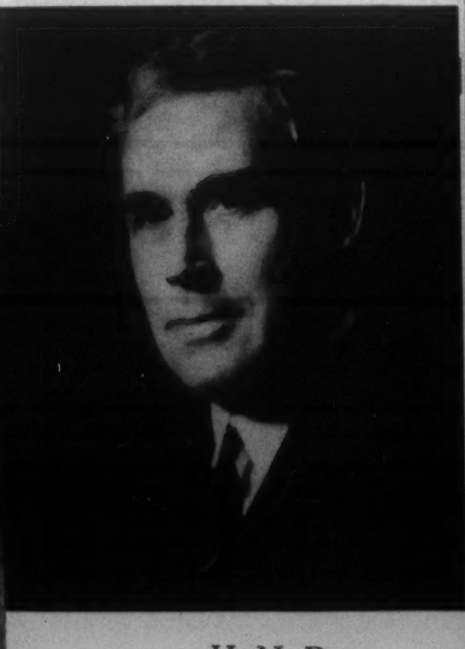
LOUIS JORDAN
Exec. Secy., both Metals Divisions



F. T. SISCO

A. F. BENTON
Lecturer





H. N. DAVIS
Lecturer

UP goes the Curtain

BOOTH
No. B-32

A NEW PROCESS

—equipment can be fuel fired or electric electrode

—ASSURED SAVINGS of 10 to 30 per cent

—NO SCALE, Maximum Hardness

—REDUCES PROCESSING TIME

50 PER CENT

A. F. HOLDEN COMPANY, NEW HAVEN, CONN.

Holden Exhibit

at Atlantic City

¶ THIS PROCESS is a product of Holden Research which has required more than two years of study and development.

¶ IT APPLIES to operations which range in temperature from 1500° to 2500° F, where work free from scale and decarburization is a problem.

¶ COME — LOOK — AND BE CONVINCED

HOLDEN Baths

A. F. HOLDEN COMPANY, NEW HAVEN, CONN.

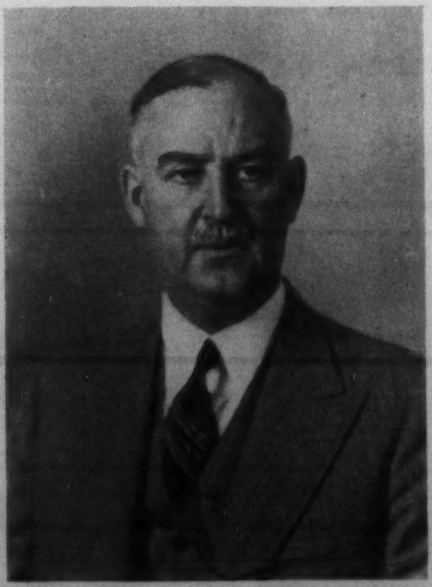
TECHNICAL PROGRAM OF THE WIRE ASSOCIATION

The program for the cooperative meeting of the Wire Association is made up of nine sessions scheduling about 15 papers. On Wednesday, Oct. 20, simultaneous sessions of the ferrous and non-ferrous divisions are scheduled for all day. All meetings will be at the Ambassador Hotel. The annual meeting of the Association will be held at 4:30 p.m., Oct. 20, at which the award of the Wire Association Medal will be presented by John C. Callaghan, chairman of the program committee.

The usual dinner and stag smoker, held each year, has been arranged for the evening of Oct. 20 at the Ambassador Hotel.

The technical program for the sessions is substantially as follows:

R. K. CLIFFORD
President



J. C. CALLAGHAN
Chairman Program Committee

MONDAY, OCTOBER 18

Afternoon Session, 2 P.M.

Paper: "Fatigue Properties of Helical Springs," by R. R. Tatnall, Engineer, Morgan Works, Wickwire Spencer Steel Co., Worcester, Mass.

TUESDAY, OCTOBER 19

Morning Session, 9:30 A.M.

Paper: "Notes on the Annealing of Nickel Silver Wire in Coils," by Thurston C. Merriman, Metallurgist, Seymour Manufacturing Co., Seymour, Conn.

Paper: "New Developments in Material Handling for Wire Mills," by A. F. Anjeskey, Sales Manager, Cleveland Tramrail Division, Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Motion Picture: "The Making of Steel Wire," Bethlehem Steel Co.

Afternoon Session, 2 P.M.

Paper: "Lime in Wire Drawing," by D. E. Washburn, Chief Chemist, American Lime & Stone Div. of Warner Co., Bellefonte, Pa.

Paper: "A.C. Electro-Pickling," by Allan B. Dove, Chemical Engineer, Canada Works, The Steel Co. of Canada, Ltd., Hamilton, Ont., Canada.

Paper: "Handling Waste Acids from Pickling Operations," by H. E. Klein, Engineer, Chemical Industry, B. F. Goodrich Co., Akron, Ohio.

WEDNESDAY, OCTOBER 20

Simultaneous Meetings of Ferrous and Non-Ferrous Divisions All Day

Morning Session, 9:30 A.M.

FERROUS DIVISION

Paper: "Cold Heading," by L. S. Cooch, Metallurgist, Buffalo Bolt Company, North Tonawanda, N. Y.

Paper: "Cold Heading Developments at G.E.," by A. R. Ryan, Industrial Engineer, General Electric Co., Schenectady, N. Y.

NON-FERROUS DIVISION

Paper: "Production of Copper from Mines to Mill," by Wm. H. Bassett, Jr., Manager, Metallurgical Development, Anaconda Wire & Cable Co., Hastings-on-Hudson, N. Y.

Motion Picture: Noranda Enterprises.

Afternoon Session, 2 P.M.

FERROUS DIVISION

Paper: "Abnormal Grain Growth and the Annealing of Wire," by B. L. McCarthy, Chief Metallurgist, Wickwire Spencer Steel Company, Buffalo, N. Y.

NON-FERROUS DIVISION

Paper: "Manufacture of Fourdrinier Wires," by Hugh E. Brown, Director of Research, W. S. Tyler Co., Cleveland.

Paper: "Modern Needs for Copper Wire," by L. H. Burnham, Engineer, Transportation Div., General Electric Co., Pittsfield, Mass.

At 4:30 P.M. Wednesday afternoon all Technical Sessions will terminate for the day and be immediately followed by the annual meeting of the Wire Association. At this meeting will be made the Award of The Wire Association Medal, by John C. Callaghan, Chairman of Program Committee.

Evening—The Ambassador—7:30 P.M.

Annual Dinner—Stag-Smoker.

THURSDAY, OCTOBER 21

Morning Session, 9:30 A.M.

FERROUS DIVISION

Paper: "A Metallurgical Study of the Factors Affecting the Quality of Galvanizing," by R. W. Sandelin, Chief Metallurgist, Atlantic Steel Company, Atlanta, Ga.

Paper: "Nickel and Nickel Base Alloys in Wire and Rod Products," by Carl Rolle, Development and Research Division, International Nickel Co., Inc., New York, N. Y.

Afternoon Session, 2 P.M.

NON-FERROUS DIVISION

Paper: "Cold Drawn Bars," by D. W. McDowell, Metallurgist, Union Drawn Steel Co., Chicago.

Paper: "Production of Bolts for Railroads and Bridges," by Chas. Fassinger, Vice-President, Oliver Iron & Steel Corp., Pittsburgh.

Motion Picture: "The Making of Steel Wire," Bethlehem Steel Co.

HARNESS *Heat*

SIL-O-CEL C-3 CONCRETE for lining furnace doors and bases conducts less than one-third as much heat as firebrick; weighs less than half as much. It is also the ideal material for insulating open-hearth flues and those sections of the regenerator system below ground.

For Every Operating Temperature . . . for Every Type of Furnace . . . There's a J-M Insulation that Will Give Maximum Efficiency and Economy

BACK of the complete line of Johns-Manville Insulations is an engineering and research organization that has specialized for years in the science of heat control. Experienced in the solving of every steel-mill insulation problem, J-M engineers have developed specialized insulating materials and insulation methods that have helped the iron and steel industry improve performance and lower operating costs on every type of heated equipment.

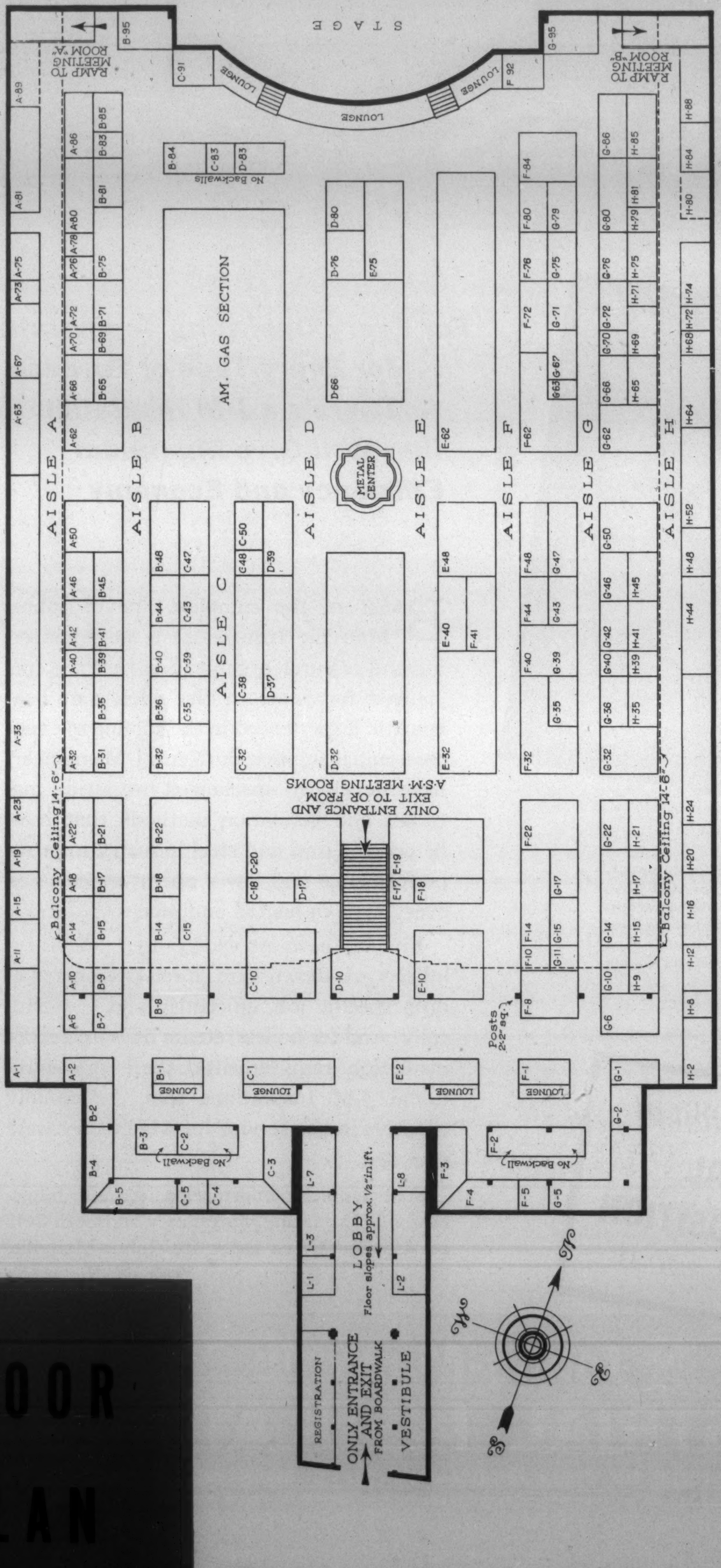
Five of the most widely used J-M Insulations are shown here. Each is designed to do a specific job, efficiently and economically. And for boilers, steam lines and other insulation requirements, there are additional J-M Insulations that are equally effective in the service for which they were designed.

For complete information on all Johns-Manville Insulating Materials, visit Booth C-43 at Atlantic City. Or write Johns-Manville, 22 East 40th Street, New York, N. Y.

See Our Exhibit at
NATIONAL
METAL EXPOSITION
Atlantic City, Booth C-43

Johns-Manville
INDUSTRIAL INSULATIONS
An insulating material for every temperature . . . for every service condition

FLOOR PLAN


STAGE
LOUNGE
RAMP TO MEETING ROOM "A"
RAMP TO MEETING ROOM "B"
No Backwalls
AM. GAS SECTION
METAL CENTER
AISLE A
AISLE B
AISLE C
AISLE D
AISLE E
AISLE F
AISLE G
AISLE H
Balcony Ceiling 14'-6"
ONLY ENTRANCE AND EXIT TO OR FROM A.S.M. MEETING ROOMS
Posts 2'-2" sq.
No Backwall
LOBBY
Floor slopes approx. 1/2" in lft.
REGISTRATION
ONLY ENTRANCE AND EXIT FROM BOARDWALK
VESTIBULE
N
E
S
W

LIST OF EXHIBITORS

A

Air Reduction Sales Co., Booth E-62. Welding and cutting torches, brazing and hard facing apparatus.
Ajax Electric Co., Inc., Booth D-37. Electric heat treating furnaces.
Ajax Electrothermic Corp., Booth D-37. High frequency furnaces.
Allegheny Steel Co., Booth C-47. Stainless steels, sheets, bars, plates, strip, tubing, wire, rivets.
Edgar Allen Steel Co., Inc., Booth H-12. Tools and die steels.
Alox Corp., Booth G-11. Rust preventatives.
Aluminum Co. of America, Booth G-4. Aluminum alloys.
American Brass Co., Booth G-47. Copper alloys.
American Bridge Co., Booth—stage. (See United States Steel Corp.)
American Car & Foundry Co., Booth G-15. Electrical bar heaters, forging heaters, rivet heaters.
American Chain & Cable Co., Booth A-32. Nibbling machines, die sets, welding wire.
American Coach & Body Co., Booth A-73. Spot welders.
American Cyanamid & Chemical Corp., Booth G-79. Case hardening compounds chemicals.
American Electric Furnace Co., Booth C-39. Electric furnaces.
American Foundry Equipment Co., Booth B-40. Cleaning and descaling equipment.
American Gas Association, Gas Section. Gas equipment.
American Gas Furnace Co., Gas Section. Heat treating furnaces.
American Institute of Mining and Metallurgical Engineers. Booth A-80. Educational exhibit.
American Machine & Metals, Inc., Riehle-Division, Booth F-8. Hardness testing machines.
American Machinist, Booth G-1. Publications.
American Metal Market, Booth G-70. Publications.
American Rolling Mill Co., Booth E-40. Stainless steels, enameling iron, sheets and plates.
American Sheet & Tin Plate Co., Booth—stage. (See United States Steel Corp.)
American Society for Metals, Booth H-85. Educational exhibit.
American Steel & Wire Co., Booth—stage. (See United States Steel Corp.)
American Welding Society, Booth C-3. Educational exhibit.
Ampco Metal, Inc., Booth H-2. High strength nonferrous alloys.
Anderson & Sons, Booth G-2. Etched and lithographed metal products.
Arcos Corporation, Booth B-2. Welding accessories.
Armstrong Cork Products Co., Booth G-46. Insulating materials.
Atlas Fence Co., Booth H-45. Industrial fences.
Audubon Wire Cloth Corp., Booth H-45. Mesh, space and flexible wire cloth for industrial applications.
Automatic Gasflux, Inc., Booth A-78. Fluxes automatically fed into gas line for welding operations.
Automatic Temperature Control Co., Inc., Booth B-65. Temperature control systems, control valves for air, gas, water, oil and steam.

B

Babcock & Wilcox Co., Booth B-14. Refractories.
Baldwin-Southwark Corp., Booth F-44. Testing machines.
Barrett-Cravens Co., Booth A-10. Industrial trucks.
Bastian-Blessing Co., Booth A-23. Oxy-acetylene welding and cutting equipment.
Bausch & Lomb Optical Co., Booth H-64. Optical instruments for metallography and spectrography.
Bellis Heat Treating Co., Booth A-2. Heat treating salts and furnaces.
Bethlehem Steel Co., Booth D-66. Carbon and alloy steels.
G. S. Blakeslee & Co., Booth A-66. Cleaning and degreasing machines.
Botfield Refractories Co., Booth B-69. Refractories.
Bristol Co., Booth G-66. Pyrometers, temperature control equipment.
Brown Instrument Co., Booth B-75. Indicating and recording instruments, automatic control equipment.
Adolph I. Buehler, Booth B-17. Metallographic equipment.
Burdett Mfg. Co., Gas Section. Gass burning equipment.
Andrew C. Campbell Div., American Chain & Cable Co., Booth A-32. Nibbling machines, die sets, welding wire.

C

Carboloy Co., Inc., Booth F-48. Cemented carbide tools.
Carborundum Co., Booth H-24. Abrasives, grinding and cutting wheels, refractory products.
Carnegie-Illinois Steel Corp., Booth—stage. (See United States Steel Corp.)
Chapman Valve Mfg. Co., Booth A-15. Chapmanizing process, steel valves.
Chilton Co., Booth H-68. Publications.
Climax Molybdenum Co., Booth C-15. Molybdenum steels and irons.
Colmonoy Co., Booth G-76. Hard facing materials, cutting tools.
Columbia Steel Co., Booth—stage. (See United States Steel Corp.)
Continental Machine Specialties, Booth B-18. Precision filing and sawing equipment.
Crown Rheostat & Supply Co., Booth F-92. Plating and polishing tools.
Crucible Steel Co. of America, Booth B-8. Tool steels.
Cyclone Fence Co., Booth—stage. (See United States Steel Corp.)

D

A. P. DeSanno & Son, Booth H-15. Abrasive cutting equipment.
Despatch Oven Co., Gas Section. Gas heat treating furnaces.
Detroit Rex Products Co., Booth H-35. Metal cleaning equipment.
Detroit Testing Machine Co., Booth H-39. Physical testing apparatus.
Henry Disston & Sons, Inc., Booth A-18. Saws, knives, files, steel and tools.
Joseph Dixon Crucible Co., Booth B-44. Stoppers, nozzles and sleeves.
Dow Chemical Co., Booth G-86. Magnesium alloy die castings, forgings, rolled sheet and plate, and extruded sections.
Driver-Harris Co., Booth F-84. Heat and corrosion resisting castings, carburizing boxes, and furnace parts.
E. I. duPont deNemours & Co., Grasselli Division, Booth C-10. Pickling inhibitors, fluxes, acids, chemicals for plating.
E. I. duPont deNemours & Co., R. & H. Chemicals Dept., Booth F-14. Heat treating salts, sodium, plating chemicals, metal cleaners.

E

Eclipse Fuel Engineering Co., Gas Section. Heat treating furnaces and equipment.
Eisler Engineering Co., Booth G-71. Welding machines.
Electric Furnace Co., Booth D-80. Heat treating furnaces.
Electric Refractories Co., Booth H-8. Refractories.
Electro Alloys Co., Booth C-20. Heat and corrosion resisting alloys.
Electro Metallurgical Co., Booth H-52. Alloy steels and cast irons.
Elevator Supplies Co., Booth F-2. Wire drawing machines.
Ensign-Reynolds, Inc., Gas Section. Soft metal melting furnaces, soldering furnaces, burners, gas compressors, air blowers.

F

Firth-Sterling Steel Co., Booth F-68. Carbide tools, stainless steel products, wear resisting parts.
Florence Pipe Foundry & Machine Co., Booth H-41. Meehanite castings.
J. B. Ford Sales Co., Booth G-43. Metal cleaners, burnishing compounds.
Foxboro Co., Booth G-36. Measurement and control instruments.

G

Gas Machinery Co., Gas Section. Forging furnaces.
Gehnrich & Gehnrich, Gas Section. Ovens, dryers, air heaters.
General Alloys Co., Booth E-10. Heat and corrosion resisting alloys, furnace parts.
General Electric Co., Booth A-33. Electric furnaces and welding machines.
General Electric X-Ray Corp., Booth A-33. X-ray testing equipment.
Globor Division, Carborundum Co., Booth H-24. High temperature heating elements.
Grob Brothers, Booth G-75. Die making equipment, saws, filing machines, brazing devices.

(Continued on page 30)

the most complete Instrument

FOR ROUTINE ANALYSIS OR RESEARCH

THE B & L METALLOGRAPHIC EQUIPMENT

Fitted for bright field, dark field or polarized light work, with magnifications ranging from 4X up to the highest possible with oil immersion objective and high power eyepiece, the B & L Large Metallographic Equipment is adapted to the most exacting work

Included in the features of the B & L Large Metallographic Equipment are: an especially designed inverted microscope; circular, ball-bearing, revolving stage 6″ in diameter; a vertical illuminator of new design using a Tungsten Arc light; a complete series of objectives and eyepieces for metallographic work; an 8″ x 10″ camera with one meter bellows draw; ball bearing focusing mechanism; and a carefully engineered shock absorbing stand.

See it at the B & L Booth, No. 64, at the National Metal Exposition or write for Catalog E-240 containing complete information. Address Bausch & Lomb Optical Co., 634 St. Paul St., Rochester, N. Y.

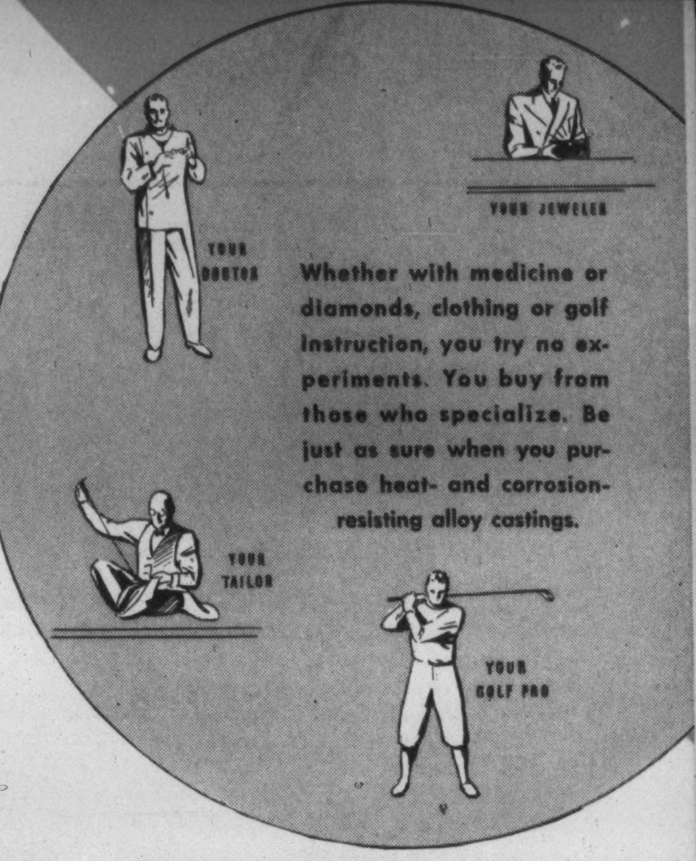
BAUSCH & LOMB

....WE MAKE OUR OWN GLASS TO INSURE STANDARDIZED PRODUCTION

FOR YOUR GLASSES INSIST ON B & L ORTHOGON LENSES AND B & L FRAMES...

Standard Specializes

N HEAT-RESISTING ASTINGS OF NICKEL HROME ALLOY • •



Whether with medicine or diamonds, clothing or golf instruction, you try no experiments. You buy from those who specialize. Be just as sure when you purchase heat- and corrosion-resisting alloy castings.

YES, we are entirely satisfied to do one thing well—to make nickel chrome alloy castings. In the last ten years Standard has manufactured many thousand items . . . trays and boxes for carburizing furnaces (see the illustration), dry shafts for normalizing furnaces, cross beams and carrier blades for walking beam furnaces, conveyors for the new radiant tube annealing furnaces . . . return bends, discs, hearth sleeves, steam rings, skid shoes, bell valves and mushroom valves, blast gates, rollers . . . and a host of other products.

You know how satisfactorily nickel chrome alloy resists heat and corrosion. Why not join its performance with Standard experience and specialization?

STANDARD ALLOY COMPANY, INC.
1679 Collamer Road Cleveland, Ohio

Standard Alloy nickel chrome alloy carburizing boxes.

Standard Alloy carburizing trays of nickel chromium.

TANDARD *Heat-Resisting* CASTING

ICKEL CHROME ALLO

H

Halcomb Steel Co., Booth B-8. Tool steels and alloy steels.
Handy & Harman, Booth B-35. Brazing alloys and silver solders
Harnischfeger Corp., Booth C-1. Electric welding equipment and motors.
Hauck Manufacturing Co., Booth A-75. Oil and gas burners regulating valves.
C. I. Hayes, Inc., Booth B-41. Heat treating furnaces.
Heat Treating & Forging, Booth A-70. Publications.
Haynes-Stellite Co., Booth H-52. Cutting tools, corrosion resistant castings.
Heller Brothers Co., Booth L-3. Small tools.
Heppenstall Co., Booth B-1. Shear blades.
Hevi Duty Electric Co., Booth F-41. Electric heat treating equipment.
Hobart Brothers Co., Booth C-38. Electric arc welding equipment.
A. F. Holden Co., Booth B-32. Heat treating baths.
Hollup Corp., Booth A-62. Electric arc welders, electrodes and equipment.
Charles A. Hones, Inc., Gas Section. Gas oven furnaces, melting furnaces, soft metal and soldering furnaces, industrial gas burners.
E. F. Houghton & Co., Booth B-95. Carburizing compounds, heat treating salts, industrial lubricants, cutting oil, leather belting and packings.

I

Illinois Testing Laboratories, Inc., Booth B-83. Pyrometers, thermometers.
Industrial Publishing Co., Booth F-4. Publications.
Industrial Steel Casting Co., Booth C-91. Steel castings.
Industry & Welding, Booth F-4. Publications.
International Nickel Co., Inc., Booth E-75. Nickel and nickel alloys.
The Iron Age, Booth H-16. Publications.
Iron & Steel Publishing Co., Booth H-72. Publications.

J

Jessop Steel Co., Booth G-10. Tool steels and alloy steels.
Johns-Manville, Booth C-43. Insulating and refractory materials.
Jones & Laughlin Steel Corp., Booth E-32. Hot and cold rolled steel, tin plate.

K

C. M. Kemp Mfg. Co., Gas Section. Gas producers and premixers.
G. N. Krouse, Booth F-5. Fatigue testing machines.

L

Lebanon Steel Foundry, Booth B-15. Steel castings.
Leeds & Northrup Co., Booth F-63. Heat treating furnaces, pyrometers and controlling instruments.
E. Leitz, Inc., Booth G-14. Photomicrographic apparatus.
Lepel High Frequency Laboratories, Booth C-48.
Lewis Machine Co., Booth B-4. Wire drawing machinery.
Lincoln Electric Co., Booth C-32. Electric welding equipment and supplies.
Lindberg Engineering Co., Booth A-67. Heat treating equipment.
Linde Air Products Co., Booth H-52. Welding and cutting apparatus, welding gases.
Ludlum Steel Co., Booth G-95. Tool and alloy steels.
Maas and Waldstein Co., Booth A-6. Lacquers, enamels, synthetics, etc.

M

Machinery, Booth G-67. Publications.
Macklin Co., Booth B-45. Grinding wheels, cut-off machines.
Magnaflux Corp., Booth G-42. Inspection method and equipment.
Magnetic Analysis Corp., Booth G-63. Magnetic analysis equipment.
Mahr Manufacturing Co., Booth B-81. Oil and gas furnaces, burners.
Manganese Steel Forge Co., Booth H-45. Manganese steel wire cloth, screens, forgings, welding wire.
Manhattan Rubber Mfg. Co., Booth G-35. Abrasive cut-off and finishing wheels.
Marburg Brothers, Inc., Booth G-6. Cutting tools, gages, pneumatic hammers.
Maurath, Inc., Booth A-50. Welding electrodes.
McKay Company, Booth H-81. Welding electrodes.
Metal Industry Publishing Co., Booth H-79. Publications.
Metals & Alloys, Booth L-1. Publications.
Metal & Thermit Corp., Booth F-22. Welding electrodes and equipment.
Metal Progress, Booth H-85. Publications and educational exhibit.
Metals Coating Co. of America, Booth E-62. Sprayed metal coating equipment.
Metlab Co., Booth D-17. Demonstration of heat treatment of metals.
Michigan Steel Casting Co., Booth F-40 and G-39. Heat and corrosion resisting castings.
A. Milne & Co., Booth H-12. Tool and die steels.
Minneapolis-Honeywell Regulator Co., Booth B-75. (See Brown instrument Co.)
Modern Machine Shop, Booth H-69. Publications.
Molybdenum Corp. of America, Booth C-35. Molybdenum and tungsten alloys.
Morrison Engineering Co., Booth C-83. Equipment for wire mills.
Mullite Refractories Co., Booth B-3.

N

National Carbide Corp., Booth E-62. Carbide.
National Cylinder Gas Co., Booth B-22. Oxy-acetylene cutting machines.
National Gas Furnace Co., Booth A-72. Heat treating furnaces.
National Industrial Publishing Co., Booth A-76. Publications.
National Tube Co., Booth—stage. Tubing.
New Jersey Zinc Sales Co., Booth F-32. Zinc alloys, die castings.
Norton Company, Booth A-1. Grinding wheels, refractories.

O

Ohio Crankshaft Co., Booth L-8. Automatically hardened crankshafts.
Tinius Olsen Testing Machine Co., Booth C-18. Testing machines.
Owen Electric Sales Co., Booth C-4. Welding machines.

P

Page Steel & Wire Div., American Chain & Cable Co., Booth A-32. Welding wire, miscellaneous wire.
Pangborn Corporation, Booth A-81. Blast cleaning and dust collecting equipment.
Paramount Oilless Bearing Co., Booth H-75. Oilless wood bearings and bushings, elevator guides, wood turnings.
Park Chemical Co., Booth H-84. Heat treating materials, buffing and polishing materials.
Parker-Kalon Corp., Booth B-21. Screws and fastening devices, measuring instruments, gage blocks.
Partlow Corp., Gas Section. Temperature controls, gas valves, safety pilots.
Henry Pels & Co., Booth F-3. Cutting and fabricating machines.
George F. Pettinos, Inc., Booth A-14. Sands, gravels, insulating cements, graphites, foundry facings, etc.
Philadelphia Drying Machinery Co., Booth B-85. Heating furnaces, oil burners, gas burners.
Horace T. Potts Co., Booth G-72. Iron and steel.
Product Engineering, Booth G-1. Publications.
Production Machine Co., Booth F-80. Polishing, finishing and buffing machines.
Pyle-National Co., Booth H-44. Airplane and airport lighting equipment, locomotive headlights, generating sets, etc.
Pyrometer Instrument Co., Booth E-17. Radiation, immersion, optical and surface contact pyrometers.
Products Finishing, Booth H-69. Publications.

Q

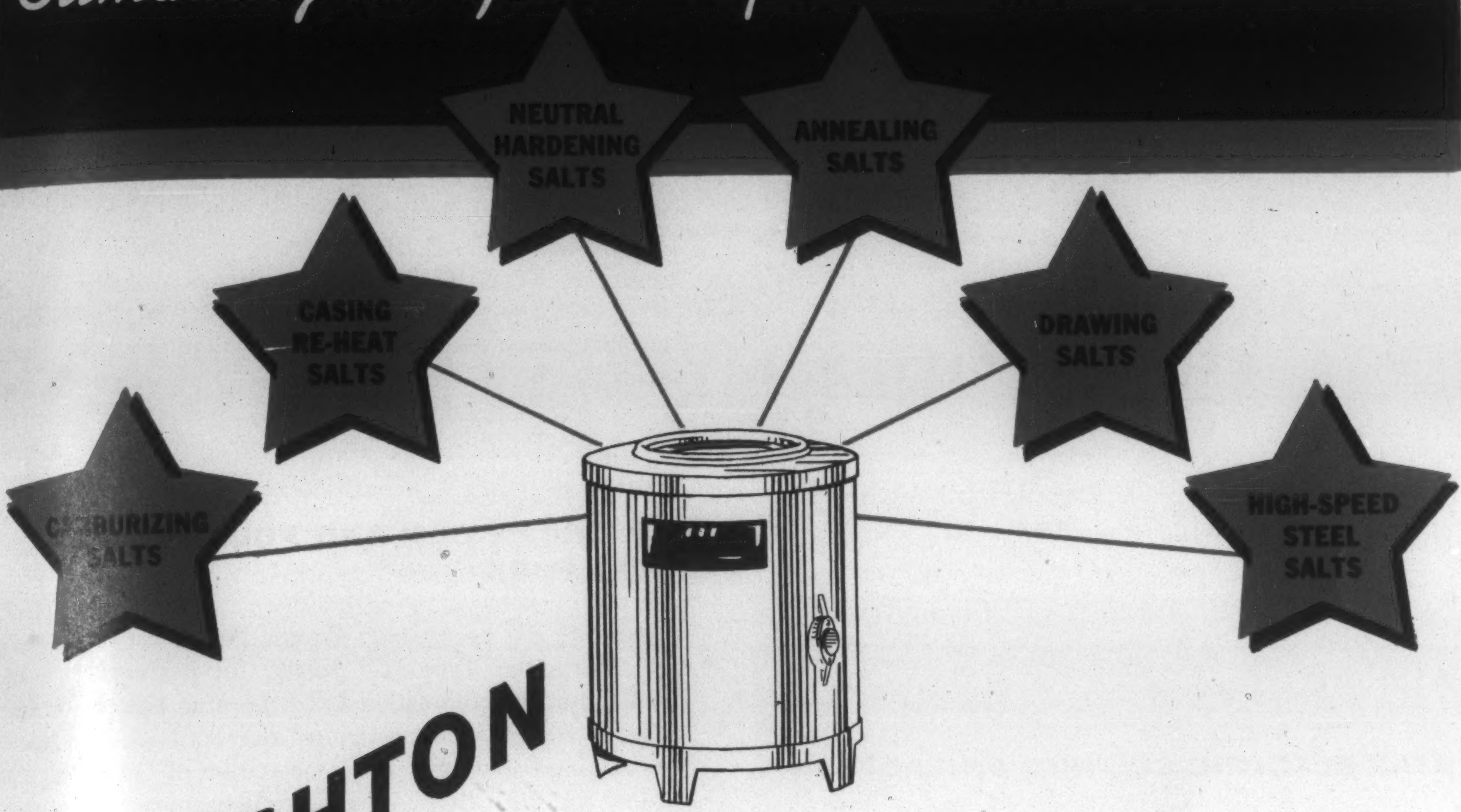
Quigley Co., Inc., Booth E-2. Refractories.

R

Republic Steel Corp., Booth D-32. Alloy and stainless steels, sheets, bolts and nuts, pig iron, etc.
Riehl Division, American Machine & Metals, Inc., Booth F-8. Hardness testing machines.
Riverside Metal Co., Booth F-10. Nonferrous alloys.
Stanley P. Rockwell Co., Inc., Booth H-71. Heat treating equipment.
John A. Roebling's Sons Co., Booth A-11. Wire rope and miscellaneous wire.
Rustless Iron & Steel Corp., Booth A-22. Rustless and stainless steels and irons.
Joseph T. Ryerson & Son, Inc., Booth B-9. Steel and allied products.

(Continued on page P 86)

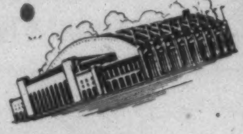
Climaxing 25 Years' Experience in Salt Baths


NEUTRAL HARDENING SALTS
ANNEALING SALTS
CASING RE-HEAT SALTS
DRAWING SALTS
CARBURIZING SALTS
HIGH-SPEED STEEL SALTS

HOUGHTON *presents...*

An All-Star Line-up of Heat-Treating Salts....

See them...



at Booth B-95
NATIONAL
METAL EXPOSITION
ATLANTIC CITY

Throughout the many heat-treating developments of the past quarter-century Houghton has been a pace-setter. Today, with new high-speed steel treatment, with production problems requiring the sure, low-cost results of liquid salt baths, we take pride in announcing—

The Most Comprehensive Line-up of Heat-Treating Salts Ever Offered - some new but proved in production lines, some veterans that for years have gone through the fires of metaldom.

Six general types . . . some sixteen products . . . covering the processes of carburizing, neutral hardening, reheating, drawing, annealing, and high-speed steel treating.

Send us your problem; let us demonstrate how "heat treatment" is synonymous with "Houghton."

E. F. HOUGHTON & CO.
Chicago - PHILADELPHIA - Detroit

THE HOUGHTON LINE
OF PRODUCTS FOR THE METAL INDUSTRY

EXHIBITORS... AND WHAT THEY WILL SHOW

NINETEENTH NATIONAL METAL EXPOSITION

ATLANTIC CITY, N. J.
1937

A

AJAX ELECTRIC CO., INC., PHILADELPHIA

Booth D-37

Exhibiting (in operation): Salt bath furnaces (Ajax-Hultgren type) for cyaniding, carburizing, annealing, and tempering. Also an Ajax-Hultgren furnace for hardening high speed steel. Products heat-treated in Ajax-Hultgren furnaces. Display of photographs showing various types of Ajax heat treating furnaces.

In attendance: G. H. Clamer, president; William Adam, Jr., vice president; J. E. Haig, secretary; Axel Hultgren (Stockholm); A. A. Anderson, Cleveland representative; E. E. Bolds, Cleveland representative; E. L. Barker, New England representative; C. A. Hooker, Michigan representative; and G. A. Ledebur, Pennsylvania and New York representative.

AJAX ELECTROTHERMIC CORP., TRENTON, N. J.

Booth D-37

Exhibiting (in operation): Ajax-Northrup furnaces will be operated from 60 kw. high frequency generator. Two pipes will be heated simultaneously in an oval coil. Round bars will be surface heated and square and round bars will be heated through the center with hot end visible. A melting furnace will be heated to illustrate use of same high frequency for both melting and heating for forging, etc. Continuous heating of pipe for normalizing will be demonstrated. A color movie of bar being heated to forging temperature will be shown continuously. Intricate stainless and alloy castings made from Ajax-Northrup melting furnace will be on display.

In attendance: Dr. G. H. Clamer, president and general manager; Dr. E. F. Northrup, vice president and technical adviser; Dudley Willcox, treasurer and assistant general manager; Robert N. Blakeslee, Jr., secretary and sales manager; George F. Applegate, superintendent; Frank T. Chestnut, electrical engineer; A. Dean Meyer, sales metallurgist; Harry G. Remmers, electrical engineer; Theodore R. Kennedy, development engineer; and Thomas A. Feehan, chief draftsman.

ALLEGHENY STEEL CO., BRACKENRIDGE, PA.

Booth G-47

Exhibiting: An interesting display of Allegheny Metal. The center section is a steel mill scene painted in several planes to give a three dimensional appearance. In the foreground is a mechanized stamping machine out of which come finished products made from Allegheny Metal.

In attendance: V. B. Browne, vice president in charge of research; C. A. Scharschu, director of research; V. N. Krivobok, associate director of research; W. J. McArdle, general sales manager; R. M. Allen, assistant general sales manager; W. R. Grunow, engineer; F. L. Kennedy, manager, New York office; F. P. Norris, manager, Philadelphia office; W. R. Murphey, sales engineer; and C. W. Green, advertising manager, (in charge of exhibit).

AMERICAN CAR AND FOUNDRY CO., NEW YORK

Booth G-15

Exhibiting (in operation): Electric Heater for heating rivets; Horizontal Type "C" Heater for heating valve and similar stock; Combination L/LA Forging Heater for heating for forging and upsetting; and Six-Foot Bar Heater for heating bar stock. A demonstration of fast production at low cost with clean, instantaneous heating will be given with these heaters.

In attendance: F. C. Cheston, sales agent; H. C. Cheston, sales agent; and W. J. Bisset.

AMERICAN COACH & BODY CO., CLEVELAND

Booth A-73

Exhibiting (in operation): Portable, flexible, and adaptable spot welder of 75 KVA capacity.

In attendance: M. L. Eckman, chief engineer; and Vladimir Prech, operator.

THE AMERICAN FOUNDRY EQUIPMENT CO., MISHAWAKA, IND.

Booth B-40

Exhibiting (in operation): A cabinet containing an animated model of our "Wheelabrator" abrasive blasting unit (half size) to show clearly how it operates. This model with a full size "Wheelabrator" unit will be the focal point in the exhibit.

A large map of the United States showing each of our installations.

Illuminated illustrations of each of our Wheelabrator machines on "translite film" and large photographs of typical installations will also be shown.

Samples of metal products cleaned by "Wheelabrating."

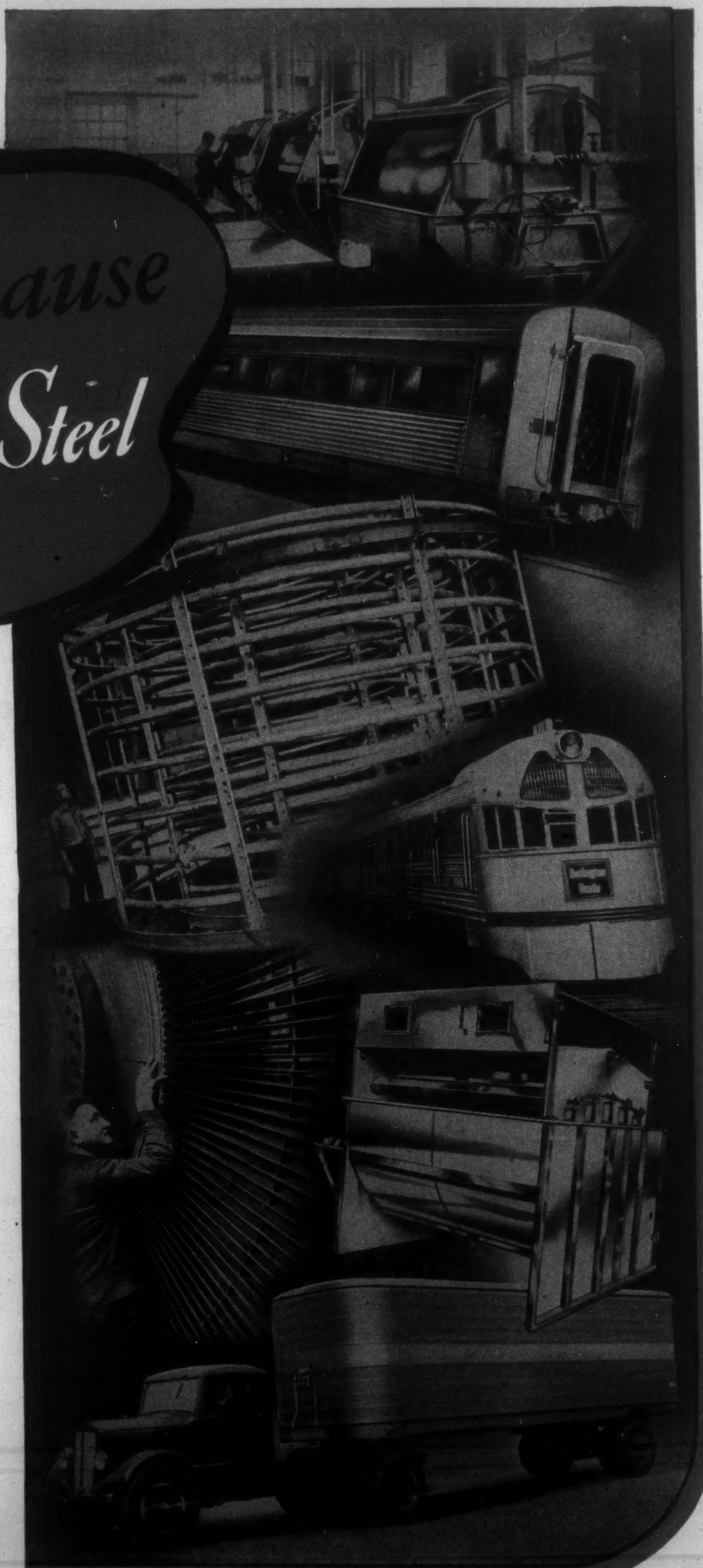
In attendance: L. L. Andrus, sales manager; A. E. Lenhard, advertising manager; and C. F. Ludwig, sales engineer.

AMERICAN GAS FURNACE CO., ELIZABETH, N. J.

Booth, Gas Section

Exhibiting (in operation): A small reciprocating full muffle continuous heating machine for clean hardening using

(Continued on page 34)



Better..because THEY'RE Stainless Steel

THROUGHOUT industry, thousands of products are *better because they're stainless steel.* Stainless steel is strong and tough. It does not rust and resists the attack of many corrosive chemicals even at high temperatures. Thus, use of stainless steel reduces weight, minimizes wear and corrosion, lowers maintenance, and adds years of useful, trouble-free life. You should investigate stainless steel for your equipment or product.

Electromet does not make stainless steel, but supplies the ferro-alloys that go into its making. For over 30 years, Electromet has cooperated with the steel industry in developing new alloy steels and irons and applying them to the requirements of modern industry. Backed by this experience, Electromet can give you unbiased help in applying stainless steel to your equipment or product. This service is available without obligation.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Carbide and Carbon Building
30 East 42nd St., New York, N. Y.

Electromet
Ferro-Alloys & Metals

Your Opportunity: See the Electromet Exhibit featuring the value of Columbium for inhibiting intergranular corrosion at the National Metal Show,
Atlantic City Auditorium, Atlantic City, N. J.,
Ocober 18-22, 1937. Booth G-62

(Continued from page 32)

whatever gaseous atmosphere may be desired.

Improved pot hardening furnace with latest type lining and insulation, numerous small burners for uniform heating and quiet operation distributed about the upper part of the furnace, which is arranged with down draft.

A small bell retort furnace for carburizing, nitriding, "Ni-Carbing," clean hardening, bright annealing and, in fact, any exacting heat treating work.

A new improved school shop table with a combination forge and oven furnace and a small pot furnace for lead or salt bath heat treating or cyaniding, or, if so desired, for aluminum melting, which is becoming so popular in the vocational schools.

One of our latest over and under fired oven furnaces with bottom vent and automatic vent closures and atmosphere adjusting burners actuated by the door mechanism.

A display of many different types of blowpipes and special burners which may be used with city gas, natural gas, or bottled gas.

Photographs.

In attendance: P. C. Osterman, vice president; Elmer C. Cook, sales manager; George A. F. Machlet, John Mehrman, Theodore Farwick, Sr., Gustav Schwab, Porter Hurd, William J. Barenscheer, S. P. Rockwell, W. A. Stumpf, and Kenneth Stumpf.

AMERICAN MACHINIST AND PRODUCT ENGINEERING, NEW YORK

Booth G-1

Exhibiting: Educational material, featuring the service of American Machinist and Product Engineering to the metal-working industry.

In attendance: Mason Britton, vice-chairman; Kenneth H. Condit, editor, American Machinist; F. H. Colvin, editor, American Machinist; John Haydock, managing editor, American Machinist; George F. Nordenholt, editor, Product Engineering; W. E. Kennedy, manager; and James A. McGraw, eastern manager.

AMERICAN METAL MARKET, NEW YORK

Booth G-70

Exhibiting: The pioneer daily newspaper of the iron, steel and metal working industries. Established in 1882 as a weekly. Published daily since 1899. Publishing daily market reports, prices, and news developments affecting the iron, steel and metal fields.

In attendance: S. P. Trench, vice president; R. A. Langer, secretary; S. Glassford, circulation manager; and M. H. Stocking, Cleveland representative.

AMPCO METAL, INC., MILWAUKEE

Booth H-2

Exhibiting: Various parts showing the uses of Ampco Metal, an extremely wear-resistant alloy of copper, aluminum, and iron. Available in sand castings, individual centrifugal castings, rolled and forged material. Some of the parts to be displayed will include gears, bushings and bearings, acid resistant equipment, feed nuts, welding jaws, non-sparking safety tools, and forming and drawing dies.

Castings of Ampco Beryllium-Copper and of hard high conductivity alloy for electrical service.

In attendance: R. W. Uecker, secretary-treasurer; J. D. Zaiser, sales engineer; R. T. Stone, Philadelphia representative; and H. C. Haines, New York representative.

ARCOS CORP., PHILADELPHIA

Booth B-2

Exhibiting (in operation): Welded stainless and welded non-ferrous products fabricated with Arcos special electrodes. We will operate a test showing corrosion resistance of 19/9 chrome-nickel weld metal.

In attendance: R. D. Thomas, president; H. E. Hopkins, treasurer; D. D. Wachter, sales manager; T. H. Nelson, sales; F. S. Tate, sales; and A. M. Taylor, superintendent.

ARMSTRONG CORK PRODUCTS CO., LANCASTER, PA.

Booth G-46

Exhibiting (in operation): Various types of brick and the materials which are used in the manufacture of these bricks. Two furnaces will be operated, attached to potentiometers, to show the comparative values of competitive bricks.

In attendance: F. M. Ritts, Mark Jenkins, Milton Hoff, B. W. Adams, Peter Gates, L. W. Bertelson, John Seanor, Spy Blythe, Ed Tanguy, A. Smith, S. Ireys, and W. W. Herrold.

AUTOMATIC TEMPERATURE CONTROL CO., INC., PHILADELPHIA

Booth B-65

Exhibiting (in operation): In addition to standard industrial timers and motor operated controllers, equipment to be shown for the first time is as follows:

Motor operated controllers—Relatrol, Type 3, Model D, with saturex relay—no moving parts, independent of vibration. Balancer, Type 3, Model E, with magnetic mercury bottle relay-inclosed, non-chattering contacts. Two position, Type 1, Model C, for slip stem valves generating 2000# push or pull, 15 seconds, 2½ inch stroke. Floating, Type 400, Model C, for large rotary stem valves and dampers. Timers—Time reverser for regenerative furnaces, Type 2300-35. Time independently adjustable for both left and right end firing. Electric furnace, 3 position, Control Type 2625, Model H7. Electric furnace balancer, Control Type 2610, Model R.

In attendance: G. H. Johanson, president; J. D. Andrews, sales manager; R. A. Smart, advertising manager; H. Wetter, district manager, Philadelphia; Walter Goehring, vice president; Walter C. Kennedy, assistant sales manager; O. W. Stowe, development; and W. C. Bellis, district manager, New York City.

B

BARRETT-CRAVENS CO., CHICAGO

Booth A-10

Exhibiting (in operation): A complete line of hand and electrically operated portable elevators for the piling of materials ceiling high thus utilizing all overhead space and having available for more productive purposes the additional floor space.

Hand operated Barrett lift-trucks—which eliminate unnecessary handling and rehandling, loading and unloading of material and hence effect a considerable savings in time,

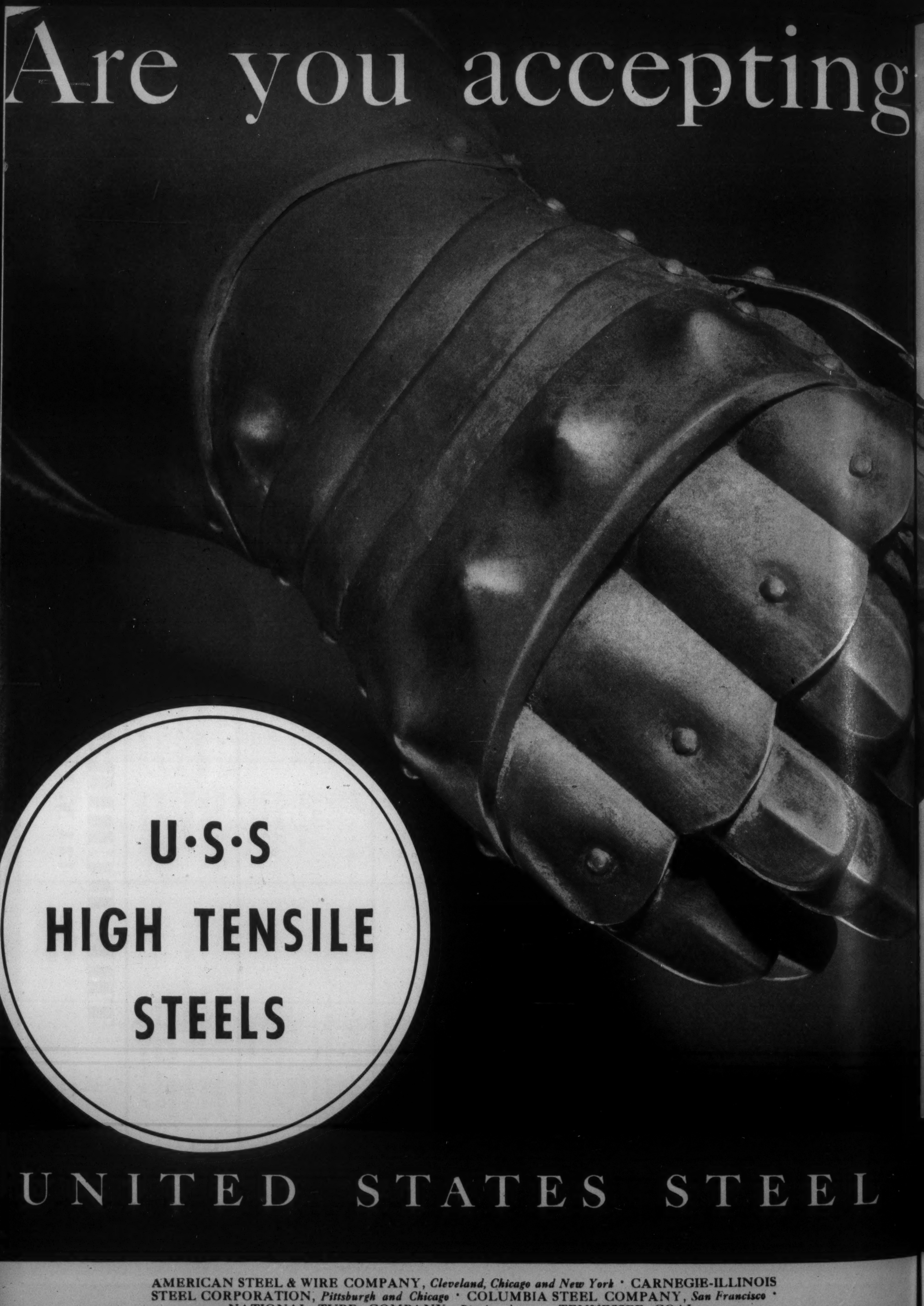
(Continued on page 38)

Corrosion Resisting MATERIALS of CONSTRUCTION

	Physical Characteristics	*Corrosion Resistance*	*Equipment Available*
DURIRON	Weight, lbs/cu/in. 0.255 Melting Point, degrees F 2300 Electrical Resistivity, Microhms per Cm³, 0°C 63 Thermal Conductivity (Ag-1) 0°C 0.125 Hardness—Rockwell C 52 Tensile Strength (½″ diameter bar) 16,000 lbs. Coefficient of Expansion, degrees Fahr. 32-212 0.00000360 32-932 0.00000775 32-2300 0.00001560 Machinable only by grinding due to extreme hardness. Weldable with oxyacetylene flame.	Duriron is outstanding among chemical corrosion resisting materials, not only because of its extremely high resistance to practically all chemical solutions but also due to its extreme hardness. The resistance of Duriron to corrosion and abrasion makes it ideal for acid solutions carrying solids in suspension, such as slurries, rouge liquors and similar solutions. Duriron is of special value to the chemical engineer in that the same equipment can be used for his whole range of corrosives, thus reducing the amount of equipment and parts necessary. Send for Bulletin No. 150.	Centrifugal Pumps standard self-priming Measuring pumps Y Valves, Gate valves, Plug cocks, Lubricated cocks, Foot valves, Check valves, "Plunger-Release" plug cocks Pipe and Fittings Steam jets Exhaust fans Kettles Ejectors Condensers Heat Exchangers Mixing Nozzles Special Castings made to order
DURICHLOR	The physical properties of Durichlor are practically the same as those of Duriron, including machining and welding.	Durichlor is almost entirely resistant to Hydrochloric Acid in all strengths and at all temperatures up to the boiling point. Handles other acids as well. Bulletin No. 50 gives complete data—send for it.	Standard equipment as listed above, as well as special equipment, is available in Durichlor.
DURIMET C 0.07% Ni 22% Cr 18% Varying percentages of Mo, Si and Cu.	Weight, lbs/cu/in. .282 Specific heat .118 Casting shrinkage per ft. 5/16″ Electrical resistivity 96.62 Melting Point 2650°F. Structure austenitic Coefficient of Expansion 20—100°C. 0.000014 20—1000°C. 0.000020 Ultimate strength 68-72,000 Hardness—Brinell 130	Durimet is especially recommended for weak sulphuric acid under the most severe conditions. Also satisfactory with dry chlorine, copper sulphate, ferric sulphate, nitric acid, crude phosphoric acid, silver nitrate, sodium hydroxide, sodium sulphite, sulphurous acid, sulphite liquors, hot or cold. Bulletin No. 171 has a more complete list—send for it.	The equipment listed above is made also in Durimet, except pipe. In addition, there is much special equipment produced, such as autoclaves, special high pressure pumps, special valves, pickling racks and baskets, and parts subject to severe corrosion. You are invited to send your drawings for estimates in Durimet or any of the other corrosion-resisting alloys, without obligation, of course.
DURCO KA2S KA2SMo C 0.07% Cr 18% Ni 8% Mo 3%	Weight, lbs/cu/in. .284 Specific heat .120 Casting shrinkage per ft. 5/16″ Melting point 2650°F. Structure austenitic Coefficient of Expansion 20—100°C. 0.000019 20—1000°C. 0.000022 Ultimate strength 80-95,000	Acetic acid glacial, hot or cold; carbolic acid, dry chlorine, fruit juices, nitric acid, crude phosphoric acid, sodium chloride, sodium sulphate, sodium sulphite, sulphurous acid gas, calcium and sodium bi-sulphite, vinegar. See Bulletin No. 171 for more complete data.	Centrifugal pumps from 1″ suction, 1″ discharge to 8″, suction, 6″ discharge; Y valves, gate valves, lubricated valves, globe valves; elbows, tees, crosses, unions, plugs, caps and couplings; Panzel strainers, other standard equipment and special castings made to order.
ALCUMITE Copper base aluminum alloy	Weight, lbs/cu/in. .273 Casting shrinkage per ft. 3/16″ Coefficient of Expansion, degree F. 0.00000935 Tensile strength Green sand castings 65- 70,000 Hot rolled rod 85-100,000	Sulphuric acid under non-oxidizing conditions, hydrobromic acid, weak hydrofluoric acid, hydrofluosilicic acid, nickel sulphate, sodium hydroxide, many organic acids, animal and vegetable oils and sludge acids. Bulletin No. 701 sent upon request.	Centrifugal pumps, valves and similar equipment as well as bars, tie rods, bolts, nuts and washers. Special equipment made to order.

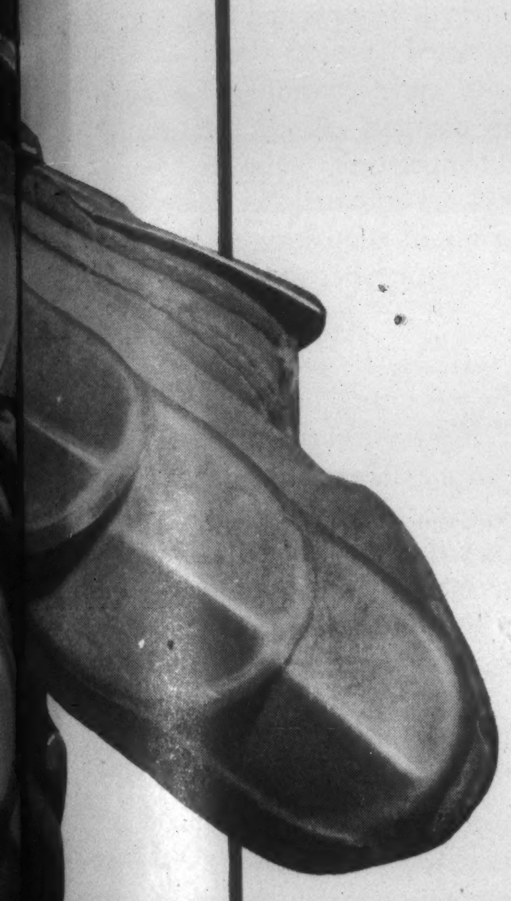
THE DURIRON COMPANY, Inc.

424 N. Findlay St., Dayton, Ohio


Are you accepting
U·S·S
HIGH TENSILE
STEELS
UNITED STATES STEEL

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York* · CARNEGIE-ILLINOIS
STEEL CORPORATION, *Pittsburgh and Chicago* · COLUMBIA STEEL COMPANY, *San Francisco* ·
NATIONAL TUBE COMPANY, *Pittsburgh* · TENNESSEE COAL,
IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Products Company, New York, *Export Distributors*

the challenge of COR-TEN?



FOR years railroad engineers have said "Give us a steel that is stronger—that will stand up in service—give it to us at a price we can afford to pay—and we will build equipment lighter."

So we produced Cor-Ten

- — *almost twice as strong as ordinary steel*
- — *with 4 to 6 times the resistance to atmospheric corrosion*
- — *with greater impact strength*
- — *with superior fatigue resistance*
- — *high in abrasion resistance*
- — *a steel you can fabricate with little change in shop practice*
- — *a steel that has made it possible to build freight cars from 3 to 6 tons lighter — with from 3 to 6 tons more payload capacity — just as strong, just as rugged as the heavy cars they replace.*

Because of the obvious advantages of lightweight construction, more than 11,000 freight cars were built of Cor-Ten, even though its cost at first was almost twice that of plain copper-steel.

Today, that price ratio has changed. The one obstacle to Cor-Ten's general use has been removed. Today the cost per pound of Cor-Ten is but 1½ times that of plain copper-steel. Today, figured on the cost per ton of capacity, Cor-Ten cars sometimes actually cost less than copper-steel equipment.

Cor-Ten today meets all the requirements set up for the ideal material for lightweight construction — strength, endurance and reasonable cost. Is there any reason for building equipment that will compel the railroads to drag around excess weight as long as it remains in service?

If you wish us to study your equipment designs, write to the nearest district sales office of a subsidiary company, or to the Railroad Research Bureau, United States Steel Corporation Subsidiaries, Frick Building, Pittsburgh.

USS

(Continued from page 34)

money and labor.

Barrett barrel trucks; Barrett drain racks; and Barrett storage racks.

In attendance: E. J. Heimer, vice president; C. E. Barnes, Eastern district manager; and J. L. Hunt, Philadelphia representative.

THE BELLIS HEAT TREATING CO., BRANFORD, CONN.

Booth A-2

Exhibiting (in operation): Lavite heat treating baths for hardening; tempering; annealing; and case hardening.

Bellis lavite electric furnace for heating automotive steels, tool steels, including high speed steels, and non-ferrous alloys.

In attendance: A. E. Bellis, president; and W. J. Holcomb, manager.

BETHLEHEM STEEL CO., BETHLEHEM, PA.

Booth D-66

Exhibiting (in operation): Talking towers with physical property charts, fractures, and photomicrographs will describe and show the effect of heat treatment on carbon, manganese, nickel, nickel-chrome, molybdenum, and spring steels.

A working model of the electric furnace heat treatment department with accompanying transparencies of views inside the plant.

A display of fractures and photomicrographs showing the effect of finishing temperatures and methods of cooling on hot rolled steels.

Tempered sheets with a range of temperatures showing the hardness effect on the samples.

In attendance: T. G. Foulkes, metallurgical supervisor; J. K. Killmer, chief of contact, metallurgical department; T. D. Shannahan, metallurgical department; J. C. Crook, metallurgical department; M. C. McFadden, metallurgical department; K. H. Read, metallurgical department; L. H. Vanatta, metallurgical department; G. M. Huck, metallurgical department; R. C. Snyder, metallurgical department; A. D. Shankland, engineer of tests; J. H. Stoll, assistant engineer of tests; M. W. Dalrymple, metallurgical supervisor; E. Gurney, metallurgical department; H. B. Bent, engineer of tests; J. F. Cotton, metallographist; W. J. Curry, contact man; H. J. Cutler, engineer of tests; C. T. Ward, assistant superintendent, rod and wire mill; J. C. Siebert, metallurgist; J. D. Schafer, superintendent Harlan Plant; E. C. Rayson, engineer of tests; C. H. Herty, research engineer; J. L. Gregg, research engineer; A. C. Chamberlain, assistant to manager development and research department; C. Schenck, engineer of development; S. Epstein, patent attorney, E. F. Kenney, metallurgical engineer, P. E. McKinney, metallurgical engineer; Henry Wysor, metallurgical engineer; L. H. Winkler, metallurgical engineer; W. R. Shimer, metallurgical engineer; A. P. Spooner, metallurgical engineer; G. F. Hocker, manager of sales; F. H. Baldwin, salesman; E. A. Buxton, manager of sales; D. A. St. Clair, salesman; R. S. Tucker, manager of sales; E. A. Gumbart, salesman; L. R. Steuer, manager of sales; G. B. Troxell, salesman; J. C. Long, manager of publications; S. H. Yorks, advertising department; and A. A. Warg, advertising department.

THE BRISTOL CO., WATERBURY, CONN.

Booth G-66

Exhibiting (in operation): Instruments developed for use in the metals industry will be featured, consisting of a new line of Pyromaster pyrometer recorders and controllers.

These instruments use the potentiometer method of measuring electromotive force in terms of temperature, using standard thermocouples and extension leads—operating on a new and simplified principle. They are not affected by plant vibration; require no lubrication, and there is no mechanical motion of any kind, except when a change in the measured temperature takes place. Controllers are of either the electric or air-operated type.

Bristol's system of coordinated process control will demonstrate the multiple-cam cycle controller for operating valves, pumps, blowers, dampers and electrical equipment. Such variables as temperature, pressure, liquid level, flow and machine speeds are automatically controlled. The system is extremely flexible in adaptation to a variety of combinations, for many different types of processes and industries.

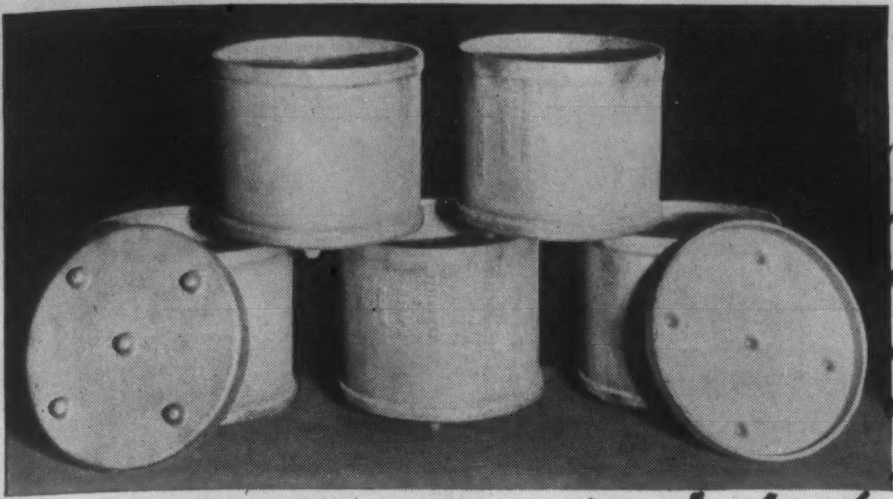
A new electric flow meter will also be on display. This instrument measures the flow of steam, liquids and gases through a closed line, and for transmitting the reading to a point remote from that of measurement, for recording on a chart or indicating on a scale, or for automatic remote control. The new electric flow meter operates on Bristol's metameter principle of telemetering, consisting of: (1) a transmitter for measuring the differential pressure across an orifice plate, venturi tube or flow nozzle, and for telemetering the reading, (2) a receiver for recording the measured values in rate of flow and totalizing by means of a new electric integrator with index counter, also a recent development.

Bristol's new Electronic Instagraph, for accurately recording rolling mill temperatures, will also be demonstrated. It consists of three units: (1) a thermo-photronic tube, (2) a potentiometer amplifier and, (3) a recording instrument. The photronic cell in the tube or "gun" is affected by the thermal spectrum only, radiated from a heated body when the "gun" is "aimed" at the mass. An instantaneous reading of the temperature is thus obtained and recorded on a strip chart. The small electromotive force generated by the photronic cell is potentiometrically measured, amplified and recorded by the Instagraph in terms of temperature. Because of the high sensitivity of the instrument and speed of response to changes in temperature, it is especially adapted for use in measuring the temperature of moving bodies.

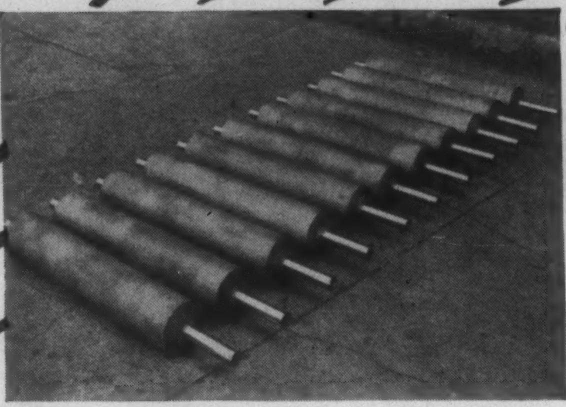
Other instruments to be exhibited include Bristol's low range draft recorder controller; wide strip potentiometer pyrometer controller; ampliset free vane pneumatic pressure controller; mercury switch temperature controller; indicating pyrometer controller with enclosed mercury switch; multiple-point pyrometer indicator with rotary switch; pyrotrol for automatically lighting and protecting gas-fired industrial furnaces and heaters from explosions due to pilot light failure; and B- Linator for closer temperature control on new and old installations.

In attendance: H. L. Griggs, vice president and sales director; L. G. Bean, sales manager; H. E. Beane, field

(Continued on page 42)



Misco "HN" light weight "Centricast" carburizing boxes 15½" dia. x 15" deep. Weight up to 2050° F.



Misco "Centricast" furnace conveyor rolls, combine light weight with rugged strength, low cost with long life. More than 1000 in use at temperatures up to 2050° F.

MISCO

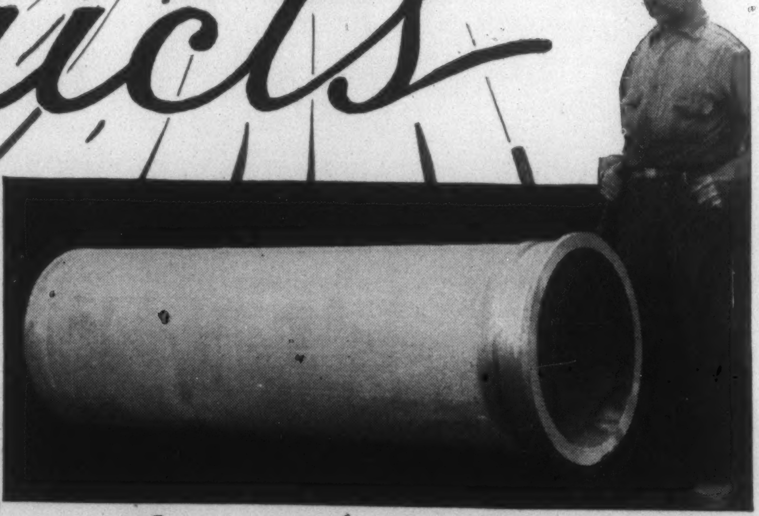
Heat and Corrosion Resistant Alloys

Centricast*

(CENTRIFUGALLY CAST)

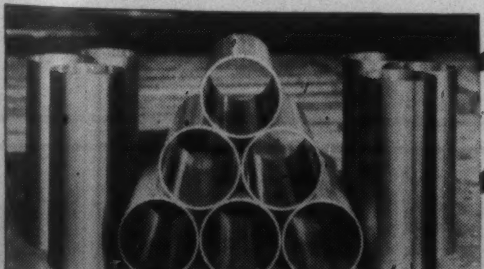
Products

5¼" OD Misco Metal "Centricast" furnace conveyor rolls. End castings flash welded to centrifugally cast tube.



Misco "Centricast" retorts are sound, pressure-tight, and dependable.

* Trade Name Registered



Miscrome 1 "Centricast" cylinder liners.

Misco "Centricast" Products as their name implies are centrifugally cast. They are free from shrinks, voids, and subsurface imperfections of any kind. The metal is dense, uniform and sound throughout. Very little machining allowance is necessary, very often none.

YOUR INQUIRIES ARE INVITED

Misco's extensive experience and diligent research in the application of heat resisting alloys are always available to present and prospective users.

MICHIGAN STEEL CASTING COMPANY

One of the World's Pioneer Producers of Heat and Corrosion Resistant Alloy Castings

1981 GUOIN STREET, DETROIT, MICHIGAN

Misco "Centricast" Products will be exhibited in Booths F40 and G39 during the National Metal Congress

...inevitably-

HEAT-TREATING APPLICATIONS

Refractories by Carborundum have become the standard Super Refractories of the metal industry because:

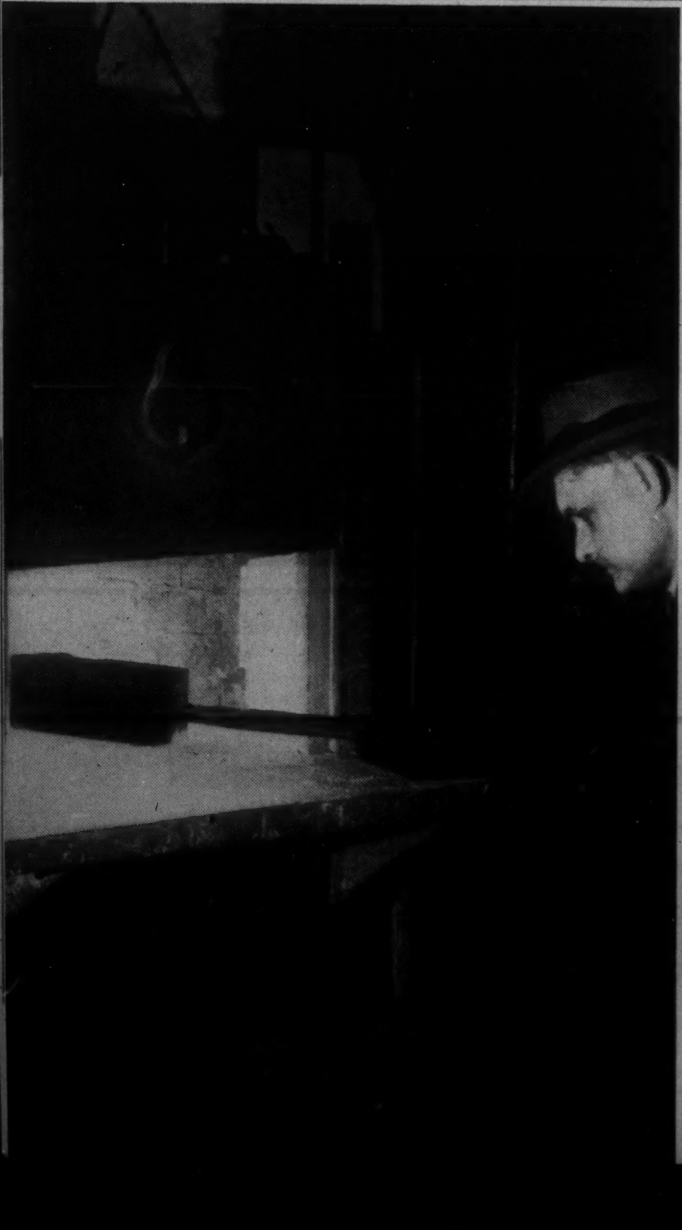
1. *They are not affected by high temperatures.*
2. *They have extremely high heat conductivity.*
3. *They withstand sudden temperature changes.*
4. *They withstand abrasive wear.*
5. *They withstand the corrosive and errosive effects of many metals and slag.*

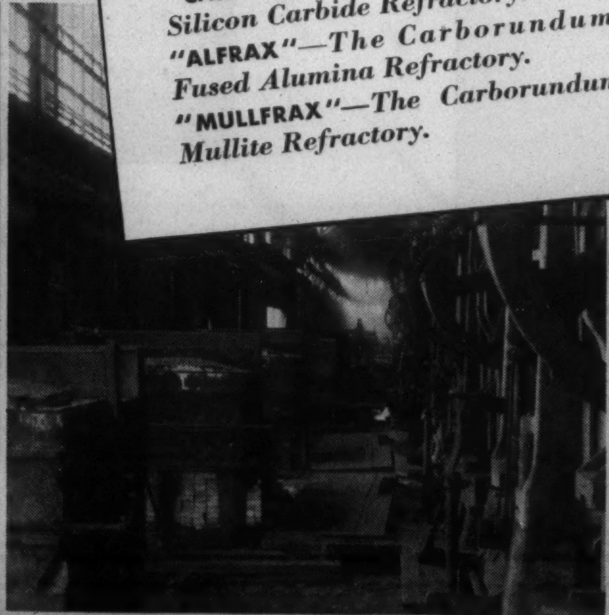
The many applications of Carborundum Brand super refractories in the metal industry are too numerous for complete listing. "Carbofrax", "Alfrax", or "Mullfrax" refractories, however, are used as muffles, hearths, supports or complete linings in stainless steel annealing furnaces—tungsten carbide sintering furnaces—controlled atmosphere furnaces for alloy steels—forging, drawing, tempering, hardening and carburizing furnaces—ferrous and non-ferrous melting furnaces.

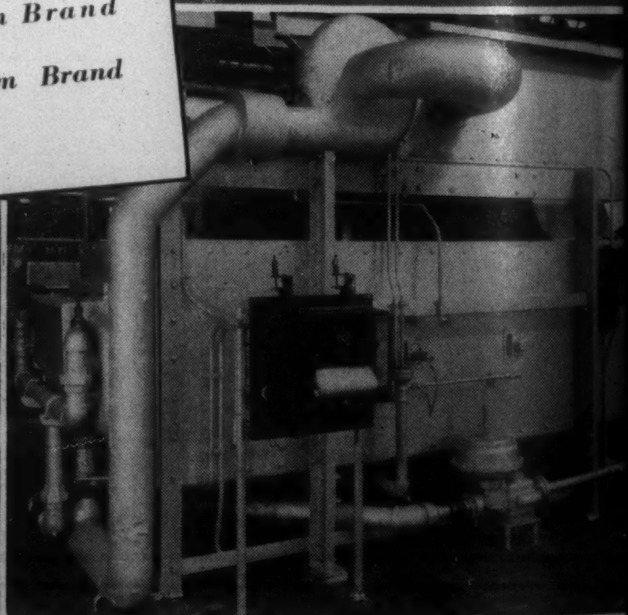
In hundreds of installations, these refractories by Carborundum are speeding up production—bettering the quality of the product—reducing costs.

We would be glad to discuss your problems at any time.

"CARBOFRAX"—*The Carborundum Brand Silicon Carbide Refractory.*
"ALFRAX"—*The Carborundum Brand Fused Alumina Refractory.*
"MULLFRAX"—*The Carborundum Brand Mullite Refractory.*

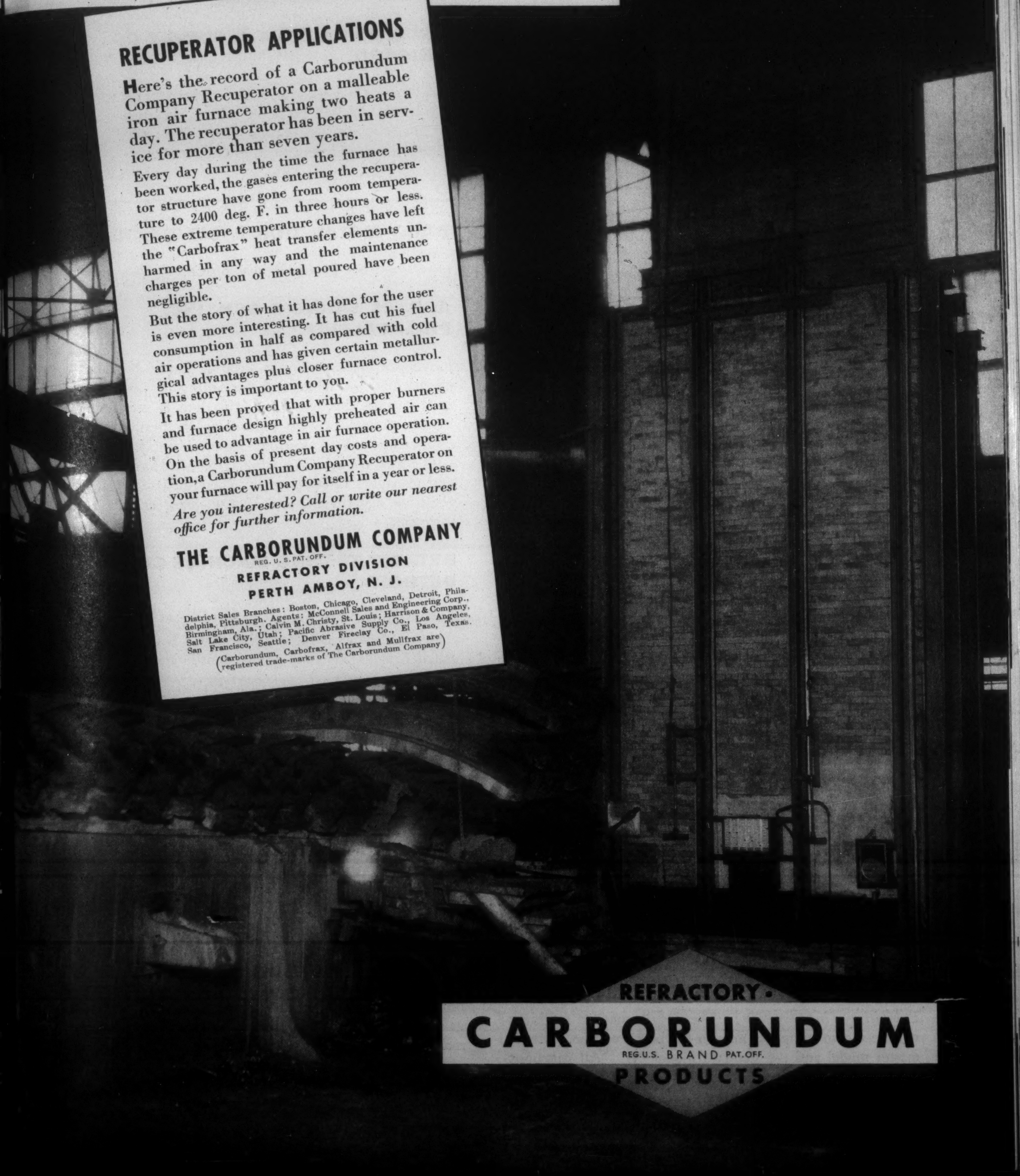






THE ANSWER IS FOUND IN REFRACTORIES *by* CARBORUNDUM

Visit the
CARBORUNDUM EXHIBIT
Space H-24 — H-34
NATIONAL METAL CONGRESS
Atlantic City, Oct. 18 to 22



RECUPERATOR APPLICATIONS

Here's the record of a Carborundum Company Recuperator on a malleable iron air furnace making two heats a day. The recuperator has been in service for more than seven years.

Every day during the time the furnace has been worked, the gases entering the recuperator structure have gone from room temperature to 2400 deg. F. in three hours or less. These extreme temperature changes have left the "Carbofrax" heat transfer elements unharmed in any way and the maintenance charges per ton of metal poured have been negligible.

But the story of what it has done for the user is even more interesting. It has cut his fuel consumption in half as compared with cold air operations and has given certain metallurgical advantages plus closer furnace control. This story is important to you.

It has been proved that with proper burners and furnace design highly preheated air can be used to advantage in air furnace operation. On the basis of present day costs and operation, a Carborundum Company Recuperator on your furnace will pay for itself in a year or less.

Are you interested? Call or write our nearest office for further information.

THE CARBORUNDUM COMPANY
REG. U. S. PAT. OFF.
REFRACTORY DIVISION
PERTH AMBOY, N. J.

District Sales Branches: Boston, Chicago, Cleveland, Detroit, Philadelphia, Pittsburgh. Agents: McConnell Sales and Engineering Corp., Birmingham, Ala.; Calvin M. Christy, St. Louis; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Co., Los Angeles, San Francisco, Seattle; Denver Fireclay Co., El Paso, Texas.

(Carborundum, Carbofrax, Alfrax and Mullfrax are registered trade-marks of The Carborundum Company)

REFRACTORY ·
CARBORUNDUM
REG.U.S. BRAND PAT.OFF.
PRODUCTS

(Continued from page 38)

sales manager; F. W. Borchers, Philadelphia district manager; G. H. Gaites, Pittsburgh district manager; C. Webber, New York district manager; E. R. Wyatt, manager sales engineering department; G. P. Lonergan, sales promotion department; and W. B. Scott, sales engineer.

THE BROWN INSTRUMENT CO. DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR CO., PHILADELPHIA

Booth B-75

Exhibiting (in operation): Brown multiple-recording and controlling potentiometer pyrometer; Brown electr-o-line automatic temperature control; Brown analy-graph; Brown radiomatic pyrometer; Brown multiple point recording controlling potentiometer pyrometer; Brown air-o-line potentiometer; Brown optimatic temperature recorder; and Brown area flow meter.

C

CLIMAX MOLYBDENUM CO., NEW YORK

Booth C-15

In attendance: L. M. Morley, vice president and general sales manager; C. L. Saunders, resident vice president, Chicago, in charge of Mid-West region; O. B. Wilson, J. A. Robinson, R. R. West, A. M. Belfry, C. L. White, J. R. Green, and R. H. Perry.

THE CARBORUNDUM CO., NIAGARA FALLS, N. Y.

Booth H-24

Exhibiting: Complete exhibit of abrasive and refractory products relating to the metal industry. Latest models of Carborundum Brand Hutton honing precision machines. Globar non-metallic electric heating elements.
In attendance: S. F. Courter, assistant to sales manager; F. Tone, Jr., assistant to sales manager; B. H. Work, sales engineer; A. Prey, sales engineer; W. J. Griffith, district sales manager, Philadelphia; O. C. Dobson, district sales manager, Pittsburgh; J. C. Gallen, sales representative; Geo. B. Detwiler, sales engineer; H. J. Wills, sales engineer; W. T. McCargo, sales engineer; F. D. Bowman, advertising manager; J. C. Rice, exhibits department; and J. E. Rice, exhibits department.

CLIMAX MOLYBDENUM CO., NEW YORK

C-15

Exhibiting: Photographs.
In attendance: Max Schott, president; J. B. Thorpe, vice president; Alan Kissock, vice president; C. M. Loeb, Jr., vice president; W. P. Woodside, vice president; T. D. Parker, metallurgical engineer; V. A. Crosby, metallurgical engineer; G. O. Loeffler, metallurgical engineer; A. J. Herzig, chemical metallurgist; R. Parke, metallurgist; J. Robb, metallurgical engineer; J. Wilson, metallurgical engineer; P. M. Snyder, metallurgical engineer; and E. R. Young, metallurgical engineer.

CONTINENTAL MACHINE SPECIALTIES, INC., MINNEAPOLIS

Booth B-18

Exhibiting (in operation): The Doall contour machines will be shown in operation. In the booth will be a Metalmaster model and the standard model "J." All functions of the machine, including sawing, filing and polishing, will be demonstrated. Materials worked on will include tool steels, mild steel, aluminum, copper, brass, alloys, as well as asbestos, hard rubber, carbon and plastics, such as bakelite, plexiglass and lucite. Also on display will be representative examples of special parts, dies, templates, cams, jigs and special tools.
In attendance: J. W. Wilkie, vice president; Floyd Hooper, advertising manager; D. A. Moreinis, New York office; and L. A. Peirez, New York office.

CROWN RHEOSTAT & SUPPLY CO., CHICAGO

Booth F-92

Exhibiting (in operation): Plating barrels, dryers, polishing lathes, rheostat, polishing wheels, and nickel anodes.
In attendance: G. A. Spencer, president; G. E. Huenerfauth, vice president; and F. P. Green, sales.

D

DAILY METAL TRADE, CLEVELAND

Booth L-2

Exhibiting: See Penton Publishing Co.

A. P. DE SANNO & SON, INC. PHILADELPHIA

Booth H-15

Exhibiting (in operation): Type C, J, and F Radiac cutoff machines demonstrating the cutting of steel and other metals using abrasive disks. Also line of small grinding wheels, mounted wheels, and cutting off abrasive disks.
In attendance: R. A. Burton, vice president; J. C. Rinehart, sales manager, grinding wheels; S. M. Hershey, production manager; L. Buckingham, chemist; B. G. Hardy, engineering department; and V. Collajezzi, engineering department.

DETROIT TESTING MACHINE CO., DETROIT

Booth H-39

Exhibiting (in operation): Complete line of testing machines including: Direct reading power Brinells; hand operated Brinells; ductility testers; tensile and universal testing machines.
In attendance: Ralph Campbell, partner; and Fred H. Nass, partner.

E

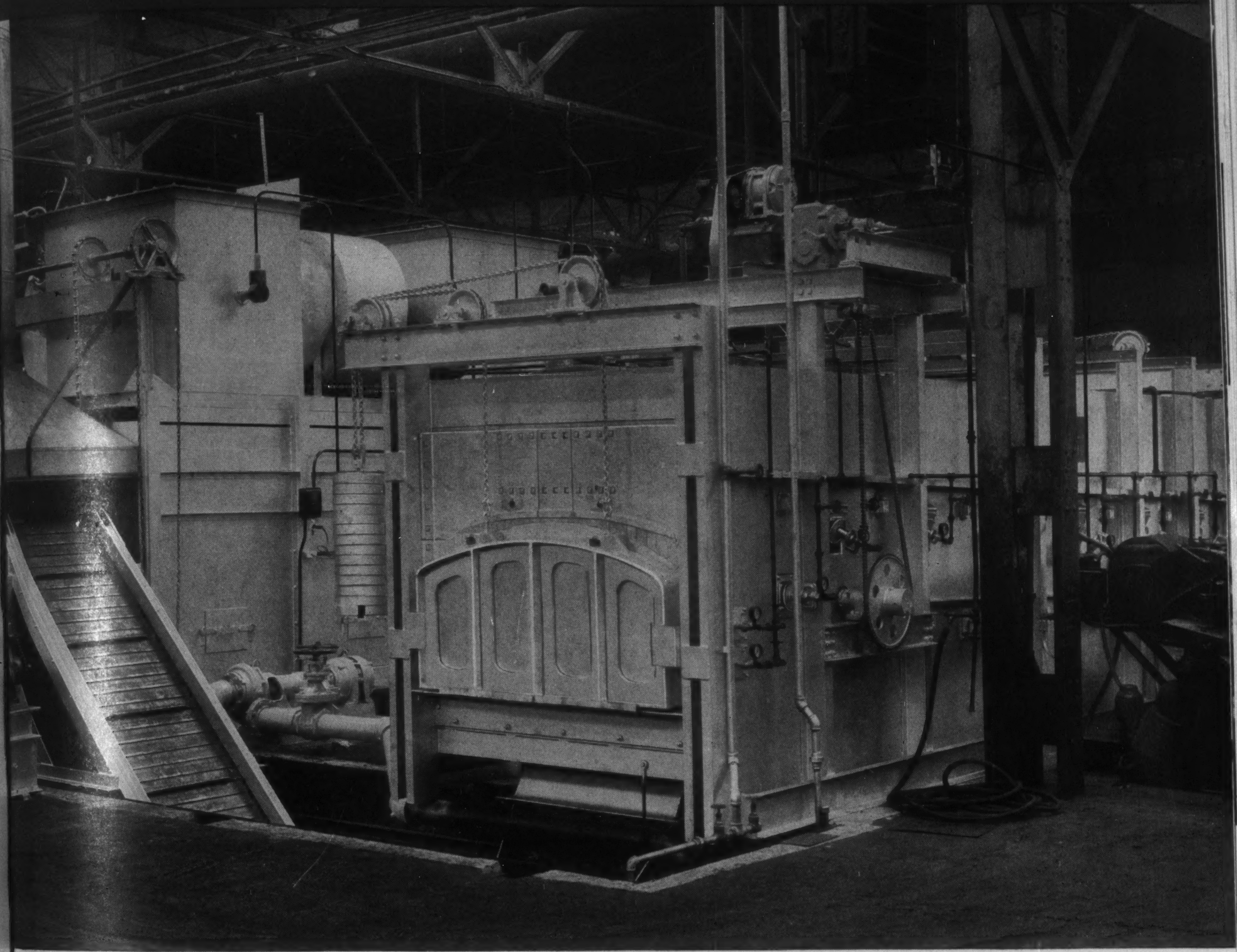
THE ELECTRIC FURNACE CO., SALEM, OHIO

Booth D-80

Exhibiting: Photographs of recent installations and new developments in special atmosphere equipment for copper brazing, scale-free heat treating and bright annealing ferrous and non-ferrous products including wire, sheet, tubing, strip, stampings, bolts, and automotive parts; also samples of material treated in these furnaces. Photographs of outstanding electric, oil, and gas fired furnaces for normalizing, carburizing, nitriding, forging, annealing and other heat treating processes; also our new gas fired radiant tube furnaces and Elfurno special atmosphere generators.

(Continued on page 46)

TOUGHENING THE SOLES OF A TRACTOR'S FEET



● Abrasive action on tractor shoes and grousers from the varied terrain over which it must operate, plus the severe stresses to which the linkage of the tractor caterpillar tread is exposed, combine to set up requirements for steel analysis and heat treatment that are necessarily exacting. For this reason heat treating equipment must be built to the highest standards possible.

Here is an SC gas-fired hardening and an SC gas-fired air-draw furnace in the plant of a nationally known tractor builder. Track shoes, weighing from 4.85 to 40.25 pounds, and grousers weighing from 3.87 to16.5 pounds are continuously conveyed through the hardening furnace; automatically quenched and conveyed to the air draw furnace where they are drawn to the desired hardness.

Surface Combustion Engineers design and build special furnaces for the most exacting demands of industry. The same engineering experience and quality of both material and workmanship is back of all SC *standard rated* gas-fired furnaces available in more than 200 different sizes.

SURFACE COMBUSTION CORPORATION, Toledo, Ohio

SURFACE COMBUSTION

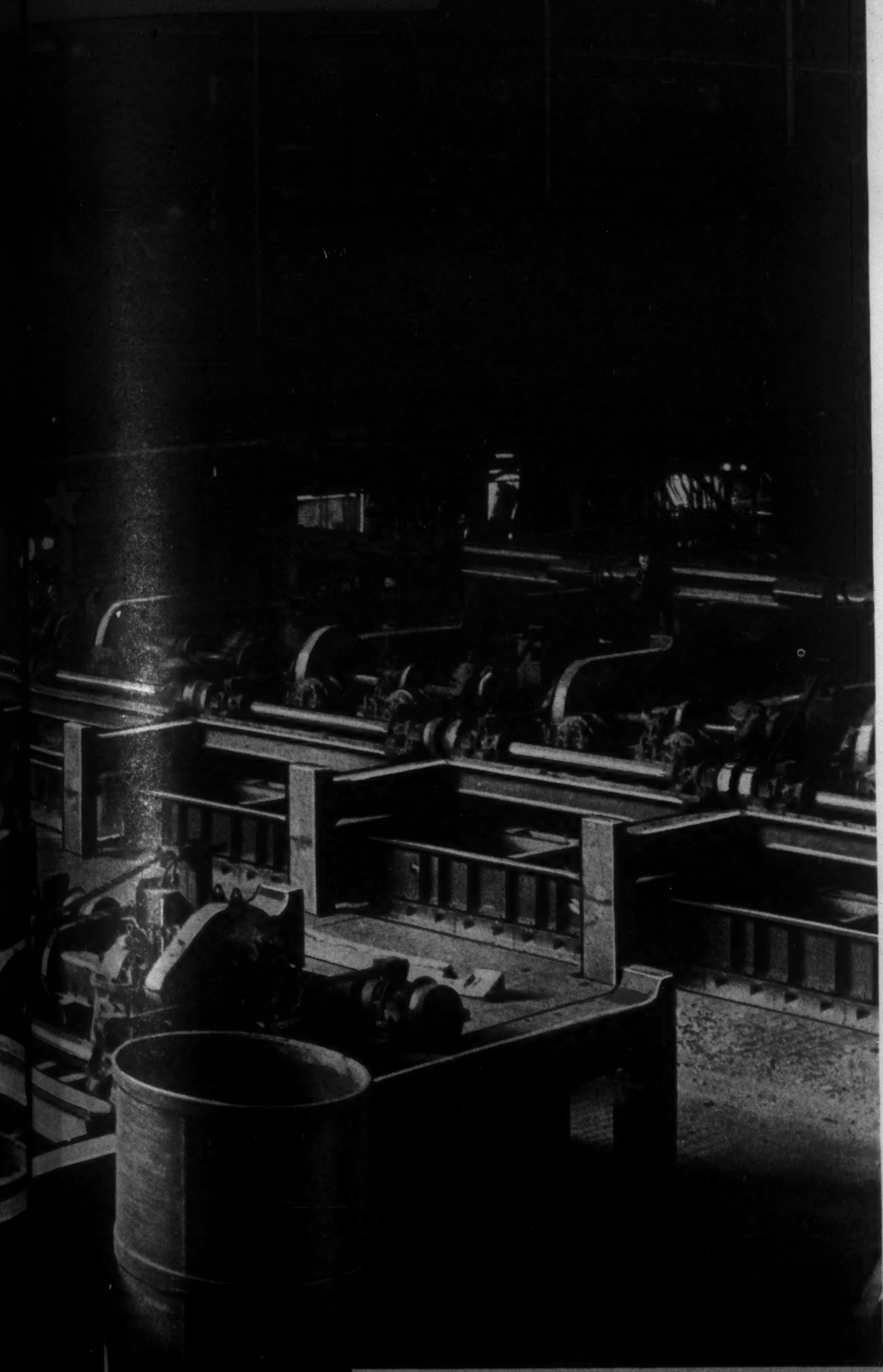
Builders of **ATMOSPHERE FURNACES and HARDENING, DRAWING, NORMALIZING, ANNEALING FURNACES for CONTINUOUS or BATCH OPERATIONS**

SOAKING PITS WITH COMPLETELY AUTOMATIC CO

ATMOSPHERE, TEMPERATURE AND PRESSURE ARE SC EN

CONTROL OF

ENGINEERED



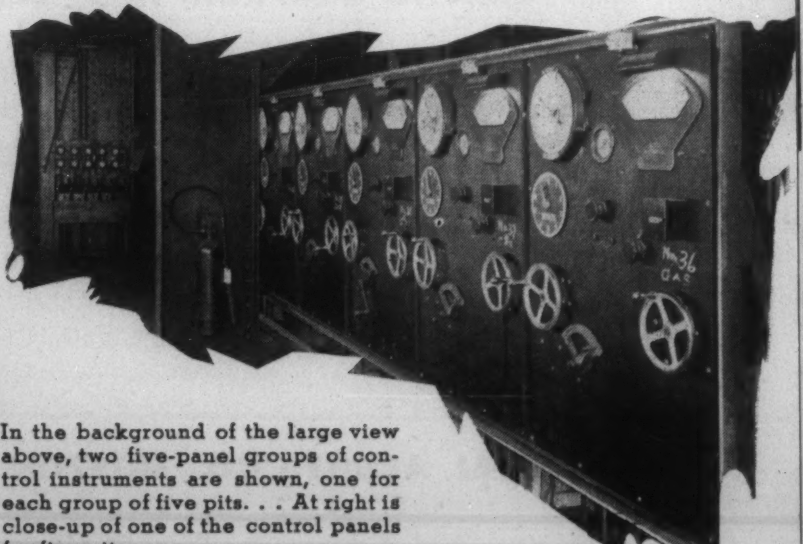
● Every day some consumer makes a demand of the steel producer which compels more rigid control of analysis to meet specifications—and every day some steel producer meets that demand. This endless cycle of improvement eventually required a more efficient soaking pit—and Surface Combustion has developed a soaking pit meeting every modern requirement of the steel producer.

Now an integral part of the installation—atmosphere, pressure and temperature control on a fully automatic basis has been made available on SC One-Way Fired soaking pits. Standard control systems include large-scale instruments mounted on control panels, one for each pit hole. Temperature of the ingot is indicated and recorded by pyrometer couples in pit, opposite burners. Absolute uniformity of heat in the new SC One-Way Fired soaking pit is insured by the horse-shoe flame travel. Much heavier construction is practical.

Scale conditions are regulated more closely because of uniformity of heating and accurate atmosphere control; less time and labor is needed for bottom making, and lower fuel costs are insured. Another advantage is the new vertical rising type sand seal cover—a decidedly efficient heat retaining and temperature control factor.

With double the ingot capacity possible as compared with older types of soaking pits, the SC One-Way Fired pit offers steel producers a practical solution to meeting increasing current demands without increase of pit floor space. Ask for detailed information.

SURFACE COMBUSTION CORPORATION, Toledo, Ohio



*

In the background of the large view above, two five-panel groups of control instruments are shown, one for each group of five pits. . . At right is close-up of one of the control panels for five pits.

SURFACE COMBUSTION

Builders of... **ONE WAY FIRED SOAKING PITS, BILLET HEATERS, PACK OR PAIR, ANNEALING, CONTROLLED ATMOSPHERE FURNACES, NORMALIZERS**

(Continued from page 42)

In attendance: R. F. Benzinger, president; F. T. Cope, general manager; A. H. Vaughan, chief engineer; C. L. West, sales engineer; K. U. Wirtz, sales engineer; C. H. Vaughan, sales engineer; N. H. Knowlton, sales engineer; G. P. Lozier, superintendent; S. J. Eberwein, assistant superintendent; B. C. Thompson, Detroit district representative; V. A. Hain, Chicago district representative; and A. E. Wright, advertising manager.

F

THE J. B. FORD SALES CO., WYANDOTTE, MICH.

Booth G-43

Exhibiting: Complete display of Wyandotte specialized metal cleaners for plating, lacquering, enameling, japanning, and vitreous enameling. For use in still solutions, electric cleaning solutions, metal parts washing machines, tumbling barrels, and spray gun equipment. For cleaning before bonderizing, anodizing, hot tinning, galvanizing, and assembling. For removing lacquer, japan, carbonized mineral oils, and fabricating compounds. Wyandotte burnishing compounds for all burnishing problems. Wyandotte neutralizers for neutralizing acid after pickling operations. Wyandotte specialized cleaners for cleaning railway equipment, aeroplane, and automotive equipment.

In attendance: B. N. Goodell, manager, industrial department; W. M. Cole, assistant manager, industrial department; W. B. Davison, manager, Philadelphia office; L. D. Dodson, manager, New York office; H. J. Perry, industrial representative, Philadelphia; and C. L. Southwick, industrial representative, Detroit.

G

AUTOMATIC GASFLUX, INC., CLEVELAND

Booth A-78

Exhibiting (in operation): A demonstration of bronze welding with new type of flux injected into the gas stream. This is the new process recently developed and will be shown at the show for the first time. All that is required is a portable fluxer, with cylinder, acetylene, and oxygen. Also a demonstration of Ferrolene gas cutting with a machine torch.

In attendance: W. L. Ulmer, president; and C. A. Medsker, chief engineer.

GENERAL ALLOYS CO., BOSTON

Booth E-10

Exhibiting: Nickel-chromium alloys, Q-Alloys; carburizing and annealing containers; cyanide and lead pots, furnace hearths, roller rails, heat and acid resisting chain; cyanide dipping baskets, recuperators, miscellaneous furnace parts, parts for every type heat treating furnace —carburizing, annealing, normalizing, hardening, tempering, forging, spheroidizing, tubes and retorts, corrosion and abrasion resisting castings.

In attendance: H. H. Harris, president; G. C. McCormick, vice president; R. D. Alger, general superintendent; W. R. Blair, engineer; A. E. Painter, New York representative; Ralph Hare, New England representative; W. J. Fitzpatrick, Philadelphia representative; Roy E. Lynd, Buffalo representative; H. G. Chase, Ohio district manager; A. L. Grinnell, Detroit sales manager; J. R. Heckman, Chicago district sales manager; J. J. Donovan, Chicago sales representative; and W. F. Bender, chemical industry representative.

GROB BROTHERS, GRAFTON, WIS.

Booth G-75

Exhibiting (in operation): Metal cutting open end band saw, 19 in. throat; metal cutting open end band saw, 36 in. throat; heavy duty continuous motion Grob filing machine; light duty continuous motion Grob filing machine; and metal butting band saw, 14 in. throat with electrical brazing device.

In attendance: Benjamin Grob, partner; and Theodore Grob, partner.

H

HARNISCHFEGER CORP., MILWAUKEE

Booth C-1

Exhibiting (in operation): P & H Hansen Smootharc welders using Smoothare welding electrodes.

Introduction of the new P & H electric hoist with variable speed push button control—one ton capacity.

The popular 250 pounds capacity Zip-Lift Electric Hoist.

Entire display of the Smoothare electrodes showing their physical characteristics.

In attendance: J. C. Joublanc, chief metallurgist; G. W. Hoskins, sales engineer, Philadelphia office; U. V. Westover, sales engineer, New York office; F. Leslie, sales engineer, New York office; L. M. Stout, district manager, Philadelphia; J. P. Morrissey, welding rod sales manager; and H. R. Noble, sales engineer, New York office.

C. I. HAYES, INC., PROVIDENCE, R. I.

Booth B-31

Exhibiting (in operation): Type HG-52 atmosphere controlled tool hardening furnace—non-operating. Type LR-51 atmosphere controlled tool hardening furnace—non-operating. Type A-3 atmosphere controlled tool hardening furnace—operating. External combusted gas atmosphere generator, non-operating.

In attendance: C. I. Hayes, president; J. E. Hines, sales manager; W. R. Gilbert, chief engineer; C. G. Paulson, sales engineer; K. W. Pettigrew, service engineer; C. A. Hooker, Detroit representative; E. F. Burke, Cleveland representative; R. G. Hess, New York representative; J E. Figner, Pittsburgh representative; R. A. Sembower, Pittsburgh representative; and F. A. Seeger, Atlanta, Ga., representative.

HEVI DUTY ELECTRIC CO., MILWAUKEE

Booth F-41

Exhibiting (in operation): Industrial and laboratory electric heat treating furnaces.

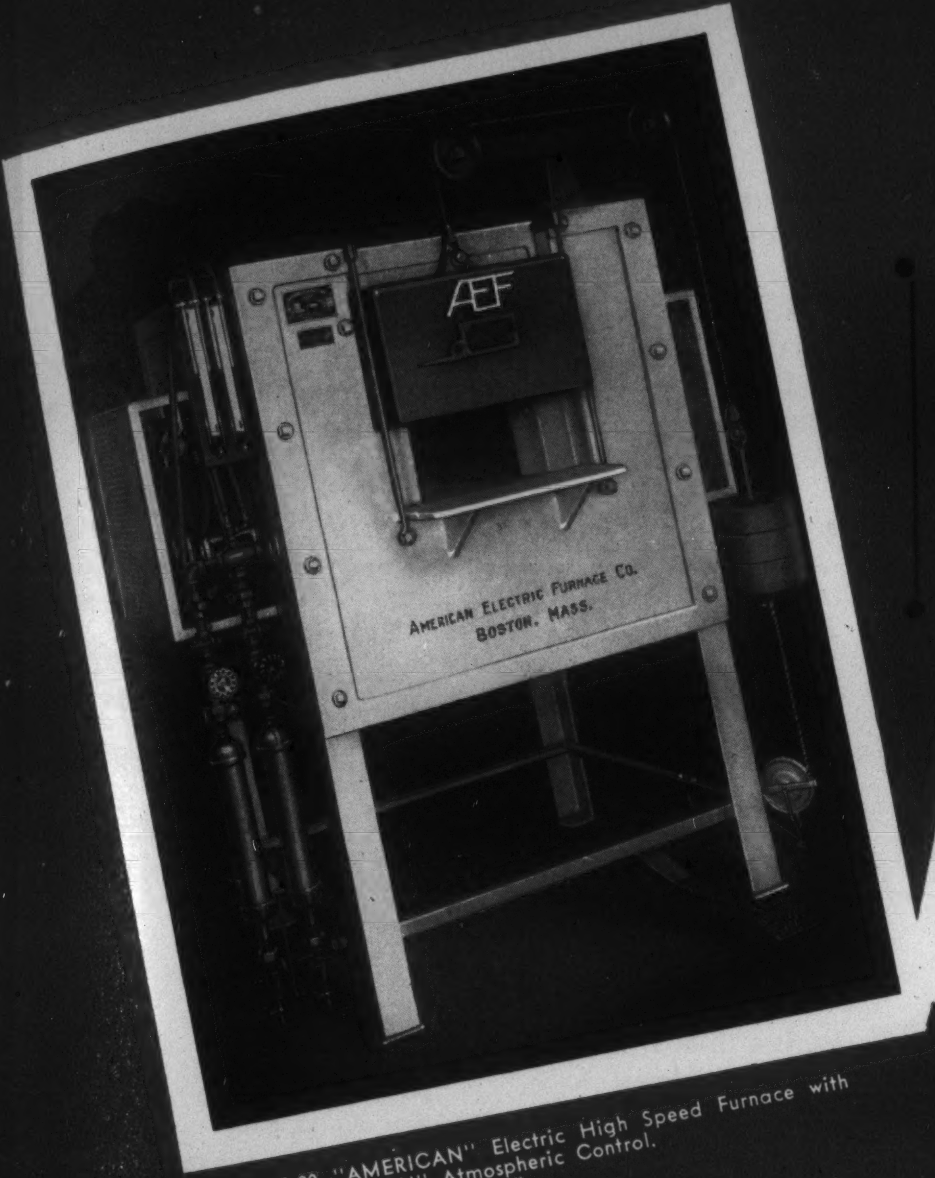
In attendance: L. W. Hayden, district manager, New York; J. S. Ayling, district manager, Cleveland; C. A. Chutter, district manager, Chicago; H. E. Koch, vice president, Milwaukee; E. L. Smalley, president, Milwaukee; and A. H. Oberndorfer, advertising manager, Milwaukee.

(Continued on page 48)

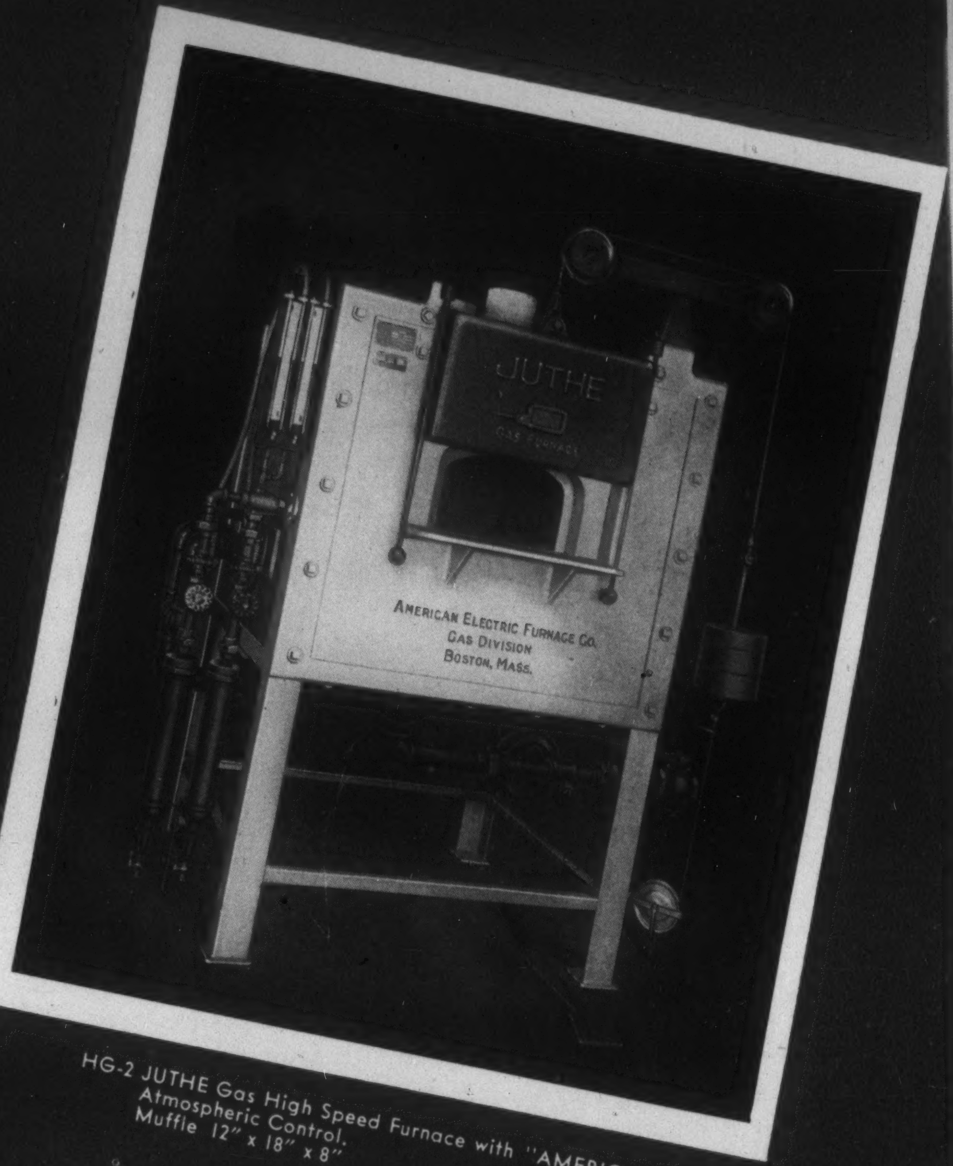
Complete Heat Treating Equipment

350° F. to 2500° F.

Electric or Gas


AEF
American Electric Furnace Co.
Boston, Mass.

HB-20 "AMERICAN" Electric High Speed Furnace with "AMERICAN" Atmospheric Control. Chamber 12" x 18" x 8"


JUTHE
Gas Furnace
American Electric Furnace Co.
Gas Division
Boston, Mass.

HG-2 JUTHE Gas High Speed Furnace with "AMERICAN" Atmospheric Control. Muffle 12" x 18" x 8"

"AMERICAN" Electric and JUTHE Gas Furnaces comprise a complete line covering a temperature range of from 350°F. to 2500°F. Nearly 100 standard sizes and as many more special sizes available for application to your work.

Whatever your requirements, they can best be met with "AMERICAN" Electric or JUTHE Gas Equipment.

Visit our booth at the National Metal Exposition. Bring your heat treating problems with you. Our engineers will be there to help you.

VISIT
BOOTH
C-39

American Electric Furnace Company

29 Von Hillern St.—BOSTON, MASS.

ALL TYPES INDUSTRIAL FURNACES

(Continued from page 46)

HOBART BROTHERS CO., TROY, OHIO

Booth C-38

Exhibiting (in operation): A full line of Hobart "simplified" arc welders, including models for welding light gauge sheet metal as well as for heavier work. The new Hobart magnetic type motor horsepower control will be demonstrated in connection with electric motor driven models. Complete gasoline engine driven equipment and generators only for belt or coupling operation. Provision will be made for demonstrating the equipment on various kinds of work and with various types of electrodes.

In attendance: E. A. Hobart, president; W. H. Hobart, vice president; O. H. Menke, factory manager; E. C. Galbreath, general sales manager; W. J. Chaffee, welder sales manager; E. K. Butterfield, welder sales; Dorsey C. Anderson, Philadelphia distributor; H. P. Gordon, New York City distributor; Leo Gordon, Boston distributor; J. Rosencrans, New York City distributor; and Henry Wehrheim, Newark, N. J., distributor.

A. F. HOLDEN CO., NEW HAVEN, CONN.

Booth B-32

Exhibiting (in operation): One electrode and three gas furnaces. All automatic controls.

In attendance: A. F. Holden, F. J. Enright, and others.

I

ILLINOIS TESTING LABORATORIES, INC., CHICAGO

Booth B-83

Exhibiting (in operation): Complete line of portable and wall type indicating pyrometers, resistance type thermometers, instantaneous direct reading air velocity meters, electronic type pyrometer controller and accessories.

In attendance: M. D. Pugh, sales manager; J. H. Torrey, New York representative; C. A. Hooker, Detroit representative; and R. W. Bergen, Philadelphia representative.

INDUSTRIAL HEATING, PITTSBURGH

Booth A-76

Exhibiting: See National Industrial Publishing Co.

INDUSTRIAL PUBLISHING CO., CLEVELAND

Booth F-4

Exhibiting: Descriptive material on the advances in the use of welding and its acceptance in fabricating metal.

In attendance: Irving B. Hexter, president; and Lester P. Aurbach, vice president.

THE INTERNATIONAL NICKEL CO., INC., NEW YORK

Booth E-75

Exhibiting (in operation): Samples of the commercial applications of the nickel alloy steels, nickel cast irons, Ni-Resist, Ni-Hard, nickel-bronze and other nickel-containing alloys.

In attendance: T. N. Armstrong, H. Beasley, E. J. Bothwell, C. E. Brinker, D. A. Curry, O. B. J. Fraser, H. J. French, George Geiger, Harold Geiger, E. J. Hergenroether, Wm. J. Kirk, F. L. LaQue, H. Larsen, H. S. Lewis, Charles McKnight, C. R. McGrail, A. C. Meyers, D. A. Nemser, N. B. Pilling, J. W. Sands, H. E. Searle, G. W. Strahan, J. S. Vanick, F. J. Walls, R. A. Wheeler, and T. H. Wickenden.

THE IRON AGE, NEW YORK

Booth H-16

In attendance: F. J. Frank, president; J. H. Van Deventer, editor; C. S. Baur, general advertising manager; C. E. Wright, managing editor; T. W. Lippert, metallurgical editor; R. E. Miller, machinery editor; F. J. Oliver, associate editor; H. E. Leonard, assistant advertising manager; O. L. Johnson, research manager; Emerson Findley, Cleveland representative; B. L. Herman, Philadelphia representative; H. K. Hottenstein, Chicago representative; Peirce Lewis, Detroit representative; C. H. Ober, New York representative; W. B. Robinson, Pittsburgh representative; D. C. Warren, New England representative; A. H. Dix, circulation manager; S. I. De Wolf, field circulation representative; and F. W. Vanderhoff, field circulation representative.

J

JESSOP STEEL CO., WASHINGTON, PA.

Booth G-10

Exhibiting (in operation): Stainless steel in various finishes to show the applicability to decorative work.

A small press will be in operation to show the severe abuse that a die and punch must withstand. Movies of a general nature and of specific operations such as inspection and testing. A series of photographs indicating the importance of tool steel in the average citizen's everyday life. A variety of tools and products.

The evolution of a stainless steel knife from electric furnace to final application. The evolution of a composite high speed steel hack saw. The evolution of a 3-ply silverbond composite stainless steel frying pan.

A "memory" contest in which the winners will be awarded prizes each day will also be a feature.

In attendance: R. E. Emery, president, Jessop Steel Company; F. T. H. Youngman, vice president and treasurer; H. E. Doughty, Philadelphia sales representative (in charge); R. M. Paxton, New York branch manager; and T. S. Fitch, manager, Composite Steel Division.

K

THE C. M. KEMP MFG. CO., BALTIMORE

Booth, Gas Section

Exhibiting (in operation): The industrial carburetor for premixing air and gas. Gas immersion, soft metal melting equipment. Atmos-Gas producer for the production of conditioned gas for bright annealing. Radiant tube roll heater for preheating hot mill rolls.

In attendance: W. S. Bassett, sales engineer; J. P. Flippen, district representative; Wm. Hunt, development engineer; W. M. Ponder, sales engineer; R. S. Van Note, sales engineer; and E. B. Dunkak, vice president.

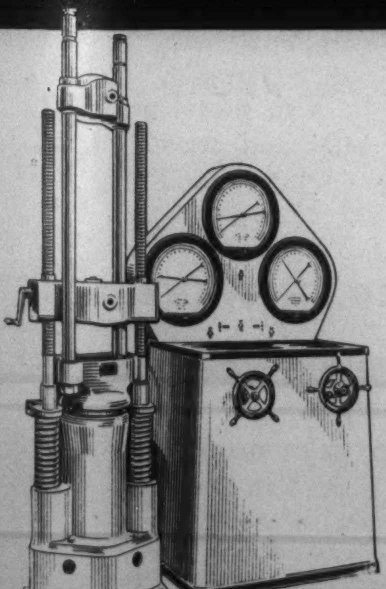
KROUSE FATIGUE MACHINE CO., COLUMBUS, OHIO

Booth F-5

Exhibiting (in operation): High speed fatigue machines, 20 in. lb. capacity.

(Continued on page 50)

TRACTORS



"Caterpillar" track-type Tractors! You see them in logging camps, on construction work, on farms . . . you'll find them in Africa and Asia, in all the Americas and Europe. Wherever there's a job of earth moving to be done . . . or countless other things they do as well . . . you'll find them.

Tough equipment built of tough stuff for tough work! And laboratory tested, down to every last bolt and nut.

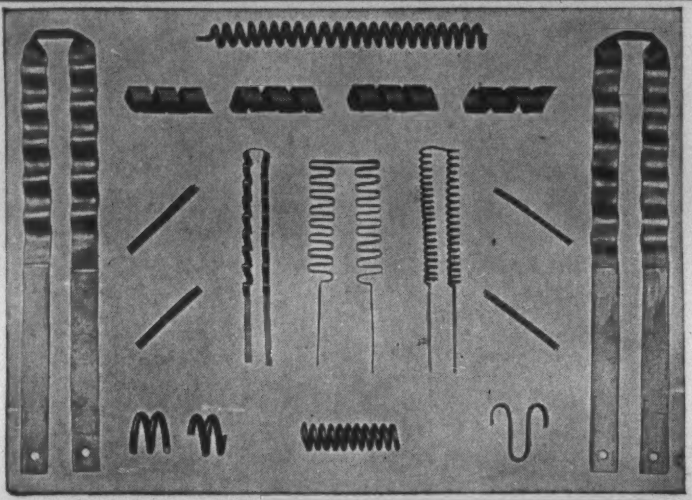
Of course, there's a Southwark-Emery Universal Testing Machine at Caterpillar Tractor Co. Leading manufacturers, in all industries, who must know the strength of materials, get their facts from Southwark-Emery testing equipment. We should like to tell you more about it.

BALDWIN-SOUTHWARK CORP.
Southwark Division, Philadelphia
***Pacific Coast Representative:* THE PELTON WATER WHEEL CO.**
San Francisco

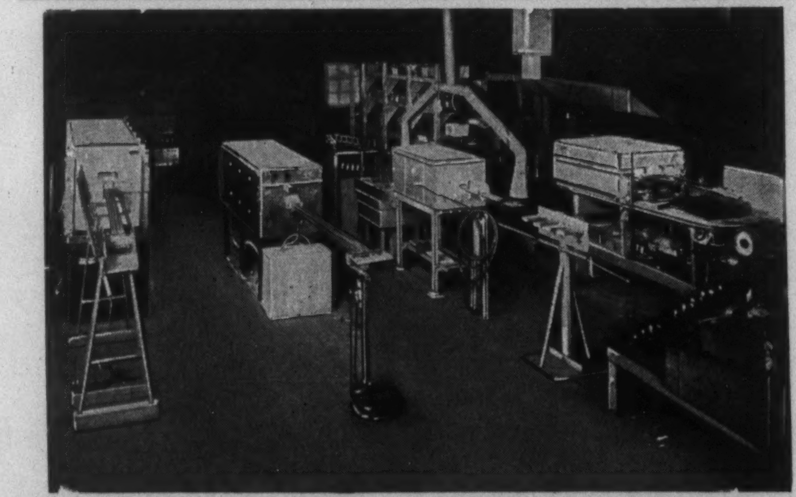
SOUTHWARK-EMERY · testing · machines

WIRE PRODUCTS
Jelliff
SINCE - 1880

Resistance Wire



Kanthal, suitable for all types of electric heating work is an alloy of chromium, aluminum, cobalt and iron. Ductile, and highly resistant to sulphurous atmospheres. Made in three grades, Kanthal is recommended for temperatures up to 2460°F. Kanthal is 35% to 40% higher in specific resistance than 80-20 nickel-chromium and has 15% lower specific gravity.



Jelliff resistance wires offer a complete range of alloys and sizes. Uniformity is guaranteed through automatic temperature control in our Strand annealing department. Prompt shipment from stock is available on most items.

Write for Kanthal Handbook.
Put us on your inquiry list.

THE C. O. JELLIFF MFG. CORP.
SOUTHPORT, CONN.

(Continued from page 48)

High speed fatigue machines, 100 in. lb. capacity. Testing three sizes of straight shank specimens.
Wire fatigue testing machine.
Thin sheet fatigue testing machine.
Plate fatigue testing machine, capable of testing up to 3/8 in. steel plate.
In attendance: G. N. Krouse, president.

L

LUDLUM STEEL CO., WATERVLIET, N. Y.

Booth G-95

Exhibiting: Tool steel, stainless, stainless castings, nitralloy, FCC products.
In attendance: Members of Ludlum Steel Co. staff; William L. Weaver, stainless casting sales; Truman Brown, special representative; A. W. F. Green, metallurgist; W. H. Wills, metallurgist. Members of Edgcomb Steel Co. staff: Leslie Edgcomb, president; W. H. Franklin, vice president; S. B. Mathews, manager, stainless steel department; G. Peterson, manager, tool steel department; and C. S. Vogel, welding engineer.

M

MACHINE DESIGN, CLEVELAND

Booth L-2

Exhibiting: See Penton Publishing Co.

MACKLIN CO., JACKSON, MICH.

Booth B-45

Exhibiting: Panel background with display of grinding wheels. Large photographs indirectly lighted showing grinding operation.
In attendance: C. L. Wiles, G. J. Rooney, and E. E. Halladay.

MAGNETIC ANALYSIS CORP., LONG ISLAND CITY, N. Y.

Booth G-63

Exhibiting (in operation): Magnetic analysis 3 inch dual method equipment for the inspection of steel for its different characteristics completely set up and in operating condition.
In attendance: Wm. S. Gould, Jr., vice president; F. O. Fischer, engineer in charge of sales and service; J. D. Wilfong, Jr., sales and service engineer; and Theodor Zuschlag, chief engineer.

MAAS & WALDSTEIN CO., NEWARK, N. J.

Booth A-6

Exhibiting (in operation): A visual presentation of product finishes engineered for specific purposes.
In attendance: B. D. Sanderson, sales manager; K. W. Berger, sales representative; and E. R. Van Der Hoef, sales representative.

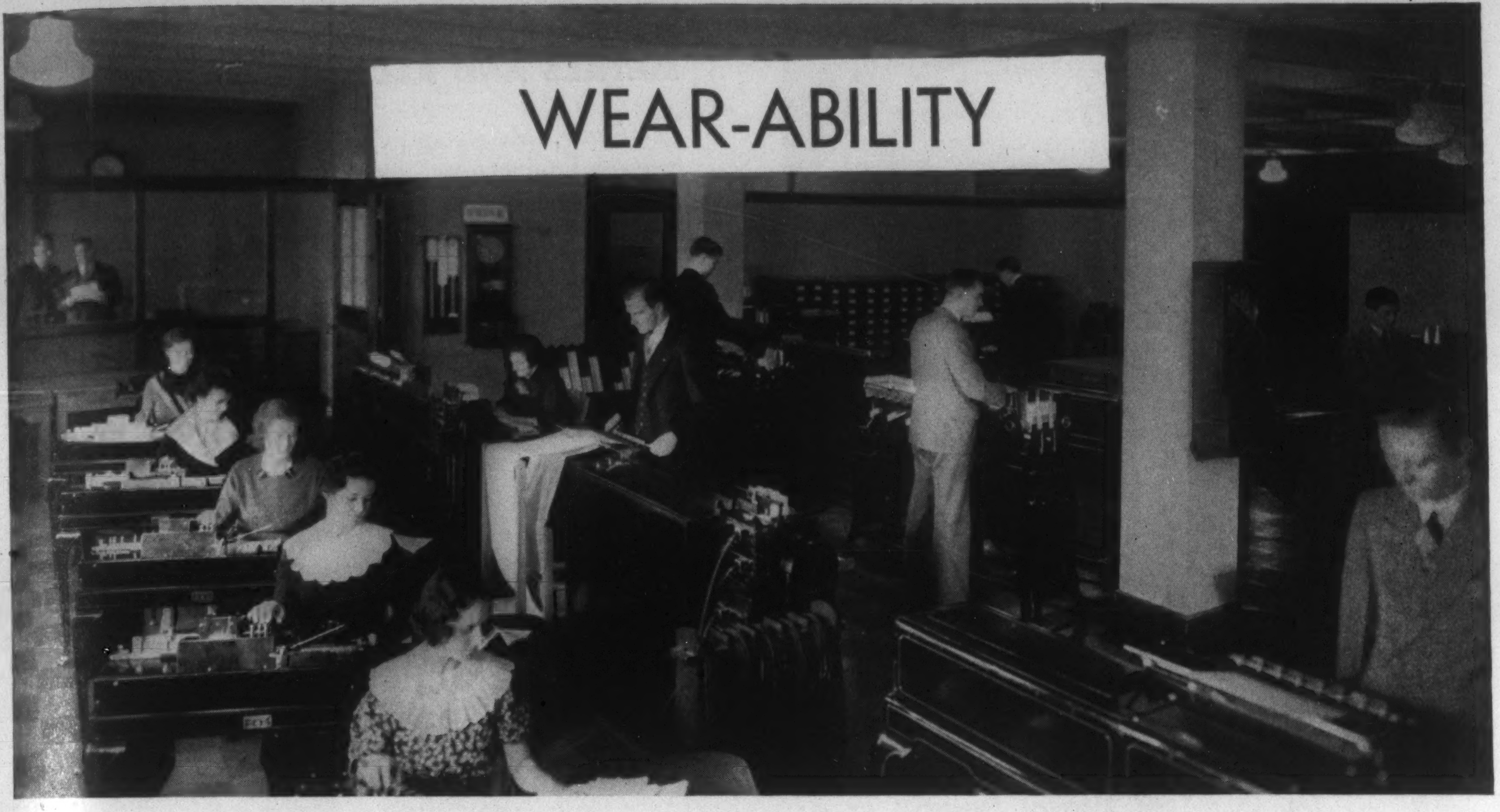
THE McKAY CO., PITTSBURGH

Booth H-81

No equipment will be displayed. Booth will be used to announce the entry of The McKay Company into the arc welding electrode field.

(Continued on page 52)

AEROCASE ACCOUNTS FOR THE



of INTERNATIONAL BUSINESS MACHINES

"We have used the Aerocase treatment since 1929 and find it very satisfactory for the case hardening of carbon and alloy steels."

Many parts such as shafts, cams, bushings, carry levers, type hammers, and gears of International business machines are heat treated with AEROCASE* Case Hardening Compound.

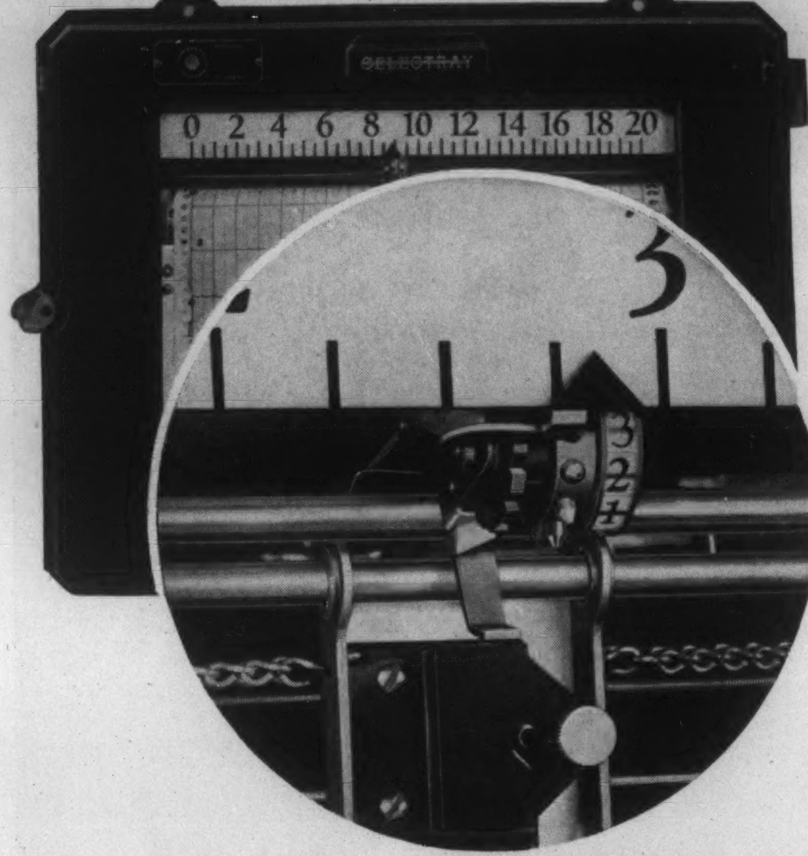
Over eight years' experience with Aerocase has proven to this company, and many others, that low cost, uniformity in case depths, and trouble-free heat treating can be accomplished with AEROCASE* Case Hardening Compounds.

SEE OUR EXHIBIT
BOOTH G79
NATIONAL METAL
EXPOSITION

★ Registered U. S. Patent Office

American Cyanamid & Chemical Corp.
30 ROCKEFELLER PLAZA — NEW YORK

CELECTRAY
PHOTOCELL···ELECTRIC···LIGHT RAY



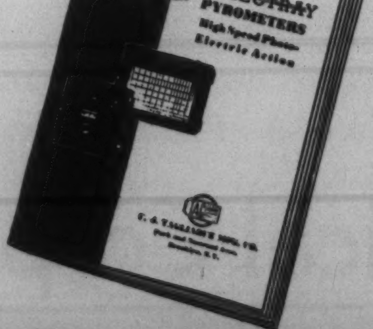
You Can Expect ACCURACY and SPEED from this PYROMETER!

TAG CELECTRAY Recording Pyrometers are accurate not only because they are exactly calibrated as electrical instruments, but because the TAG Method of photoelectrically balancing a potentiometer or Wheatstone bridge is precise. Recording is accurately repeated even in a recently announced High Speed Recorder which will handle as many as twelve records in a little over one minute . . . balancing error a few hundredths of one percent.

Shown in the circle above, is the mounting of the recording styli and slide-wire contact as a single unit—an essential feature which contributes to the maintenance of recording accuracy.

TAG CELECTRAY Recording Pyrometers have other exclusive features which assist their notable performance . . . for instance, Adjustable Chart Speed which can be changed in a few seconds with a screw-driver to either 1, 2, 3, 4 or 6 inches per hour.

And, again, different from other instruments, the CELECTRAY Single Point Recorder and Recorder-Controller, have a pen moulded of a transparent, unbreakable material designed for ease of filling and steady flow . . . It draws a line a mile long.



See the complete line of TAG CELECTRAY Pyrometers for Indicating, Recording and Controlling at Booth No. B41, National Metal Exposition in Atlantic City . . . And ask us to send you your copy of Catalog No. 1101-78 which describes these CELECTRAY Pyrometers fully.

C. J. TAGLIABUE MFG. CO.
Park & Nostrand Ave's., Brooklyn, N. Y.

(Continued from page 50)

In attendance: Thomas J. McKay, president; Marcus R. Peck, vice president; Frank A. Bond, vice president, James C. McKay, vice president; C. E. Briner, purchasing agent; Fred H. Lewis, plant manager, York, Pa.; Thomas J. McKay, Jr., sales department; M. J. Van Dreser, sales department; L. E. Faulkner, chief chemist; Dr. Davis Helm, research engineer; and John Harris, research engineer.

METALS AND ALLOYS, NEW YORK

Booth L-1

Exhibiting: Metals and Alloys, "The Magazine of Metallurgical Engineering." Also, metallurgical books.

In attendance: H. W. Gillett, editorial director; E. F. Cone, editor; Fred P. Peters, assistant editor; P. H. Hubbard, publishing director; W. P. Winsor, business manager; D. B. McIntosh, Eastern advertising manager; G. E. Cochran, Western manager; J. Howard Wilson, district manager; and C. S. Roever, district manager.

METAL & THERMIT CORP., NEW YORK

Booth F-22

Exhibiting (in operation): The complete line of Murex heavy coated electrodes, including the newly developed Murex Genex and Murex Vertex, will be on display. Genex is an all-purpose electrode, specially designed for welding where the fit-up between plates is poor. Vertex is a three-position electrode for flat, vertical or overhead welding. Electrodes will be demonstrated in a welding booth where an expert operator will be in attendance at all times.

In addition, there will be a second booth where frequent demonstrations of Thermit welding will be given and actual welds will be made by the Thermit process.

In attendance: John B. Tinnon, sales manager; J. H. Deppeler, chief engineer; C. D. Young, Chicago manager; H. T. Thompson, Pittsburgh manager; John Plaskon, sales engineer; E. J. Knapp, sales engineer; C. D. Cooper, sales engineer; and Merritt L. Smith, advertising manager.

MICHIGAN STEEL CASTING CO., DETROIT

Booths F-40 and G-39.

Exhibiting: We will feature centrifugally cast products including stainless steel pipe, carburizing boxes, retorts, cylinder liners. We will also exhibit heat resisting alloy chain and belt conveyors and particularly pusher chain, a recent development of more than usual interest. Also furnace parts and miscellaneous heat and corrosion resistant castings. A comparatively new development which will be shown is a stainless steel or heat resisting alloy conveyor roll made by flash welding stationary cast journals to a centrifugally cast tube.

In attendance: E. D. Flintermann, president; J. D. Corfield, sales manager; W. E. Broadbelt, Philadelphia representative; C. B. Kentnor, Jr., New England representative; R. J. Wilcox, metallurgist; W. A. Hakin, sales engineer; and E. A. Christensen, sales representative.

MODERN MACHINE SHOP AND PRODUCTS FINISHING, CINCINNATI

Booth H-69

Exhibiting: Displays featuring the two publications, Modern Machine Shop and Products Finishing.

(Continued on page 54)

LARGEST EXHIBITORS IN OUR LIN
AT THE STEEL SHOWS FOR 18 CONSECUTIVE YEARS

Most of the old timers in the heat treating game have taken in one or more of the A.S.S.T. and A.S.M. annual Steel Shows, many have seen them all. They will tell you that no alloy company at any time during the past eighteen years ever showed a third as many castings as General Alloys have shown every year. General Alloys' exhibit always includes scores of Q-Alloy and X-ite castings borrowed from the largest alloy installations in the world, with full service records.

The unparalleled experience of this organization as the oldest and largest exclusive manufacturer of heat and corrosion resisting castings is at your disposal for the solution of your problems whether you require the simplest heat treating containers or furnace parts or the most exacting corrosion and heat resisting alloy mechanism.

E FOOTSTEPS OF GENERAL ALLOYS MARK THE PATH OF AN INDUSTRY

GENERAL ALLOYS IS ON THE MARCH!

General Alloys are going places, doing things, operating 24 hours a day, meeting the demand for Q-Alloys, X-ite, heat and corrosion resisting castings—but we have only started. Our new developments in design, metallurgy, foundry practice, on which *General Alloys leadership takes another long stride*, are just being released and they will obsolete hundreds of presumably modern alloy installations of many types. Those depression years were good years for all of us. They made us think and work harder than ever before to give you better alloy castings—and even more important to develop designs that save time and money in your processes.

If you contemplate the purchase of any type of conveyor furnace, the *real works* of which is alloy mechanism, specify General Alloys castings, not only for quality and dependability but because General Alloys field men are on the job if you want them and a General Alloys guarantee backing up any furnace guarantee is the best insurance obtainable on any equipment you buy.

If you do not read our house organ,* Alloy Progress, *running in the magazine,* Metal Progress, *send us your name for our mailing list.

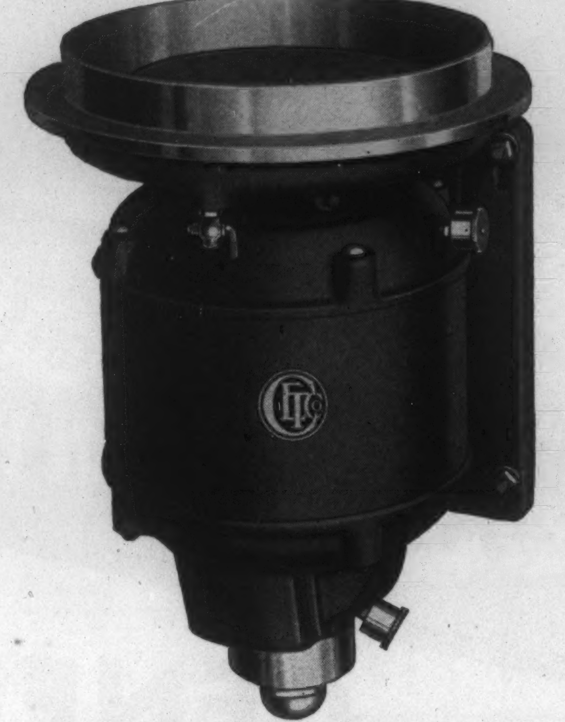
GENERAL ALLOYS CO.
BOSTON, MASS.
Offices in 18 Principal Cities
Oldest and Largest Exclusive Manufacturers
Heat and Corrosion Resisting Castings

General Alloys Co., 405 W. First St., Boston
Put my name on your mailing list for Alloy Progre
Name ....
Title ....
Firm ....
City .... State ....

The Cincinnati

METALLOGRAPHIC
POLISHING MACHINE

A NEW STANDARD
OF EFFICIENCY



DISTINCTIVE FEATURES OF

The Cincinnati

- Variable speed motor
- Speed range from 300 to 3000 RPM
- Ball Bearings throughout
- Smoothness of operation at any speed
- No belts to slip
- No friction drive
- No excessive noise or vibration
- Bronze bowl, disk and ring resist corrosion
- No splashing of polishing material
- Easy to clean

A Few Users of
The Cincinnati
METALLOGRAPHIC POLISHING MACHINE

- American Sheet & Tin Plate Co.
- Crucible Steel Company of America
- Aluminum Company of America
- U. S. Naval Aircraft Factory
- American Rolling Mill Co.
- Department of Mines, Ottawa, Canada
- Carnegie Steel Co.
- Harvard University
- School of Mines, Rolla, Mo.
- Mass. Institute of Technology
- Ford Motor Co.
- General Motors Corp.

Write for complete bulletin

THE CINCINNATI ELECTRICAL TOOL CO.
CINCINNATI, OHIO, U. S. A.

(Continued from page 52)

In attendance: Don G. Gardner, publisher; H. Campbell, editor (Modern Machine Shop); F. W. Vogel, managing editor (Products Finishing); J. M. Krings, advertising manager; G. M. Fillmore, Eastern manager; J. Vandervoort, Eastern representative; G. H. Meyers, Western manager; and J. H. Koch, Central Western manager.

MOLYBDENUM CORP. OF AMERICA, NEW YORK

Booth C-35

In attendance: M. Hirsch, president; V. R. Lansing, vice president; E. A. Lucas, vice president; W. H. Phillips, vice president; N. F. Tisdale, metallurgical engineer; E. Steward, Western sales manager; and H. Furlong, Detroit sales manager.

MORRISON ENGINEERING CO., INC., CLEVELAND

Booth C-83

Exhibiting (in operation): Morrison "Flash Baker" for baking wire rods. This baker is a pit-type oven. The top is sealed by high velocity air curtain. The hot air enters the chamber at high velocity and passes directly into coils from both ends, fusing throughout wire strands of the coils. The rods are baked in a few minutes.

The baker is designed for either straight line or circular cleaning line plan, requiring minimum floor space, and economy in operation.

A Morrison welding rod drying unit for baking flux coated welding rods. This unit is an oven made up of individual baking zones, all heated by a Morrison direct gas fired air heater. The heat is separately controlled in each zone to best suit the condition of the rods. The welding rods are conveyed through these zones on specially designed chain, remaining thereon until they emerge from the oven, completely and satisfactorily baked.

This drying unit gives high production, is economical to operate, and requires minimum floor space.

In attendance: J. R. Morrison, president; C. J. Pimsner, vice president; C. A. Litzler, engineer; W. H. Shelton, sales engineer; and G. C. Paxton, production superintendent.

N

NATIONAL INDUSTRIAL PUBLISHING CO., PITTSBURGH

Booth A-76

Exhibiting: "Industrial Heating"—a monthly publication, devoted to all industrial heating processes, furnaces, ovens, kilns, etc., as used in the manufacture and treatment of iron, steel, non-ferrous metals, glass, ceramic products, etc.

In attendance: I. Stanley Wishoski, editor.

THE NEW JERSEY ZINC CO., NEW YORK

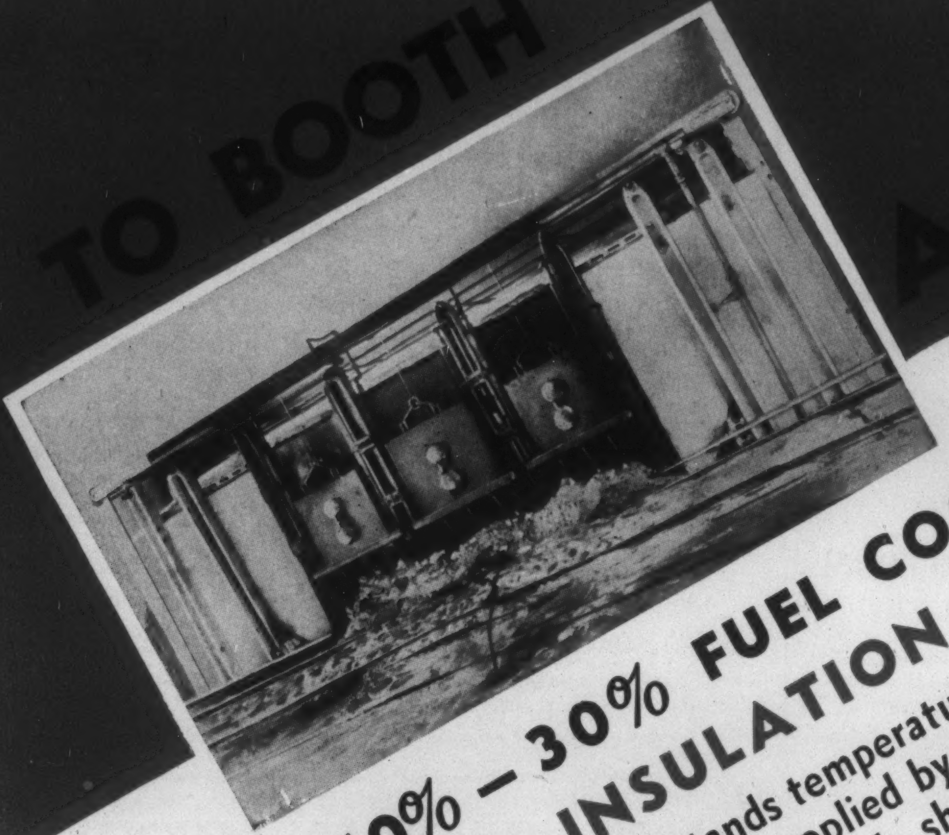
Booth F-32

Exhibiting (in operation): Die castings of zinc alloy—both raw and finished—completely assembled products which contain such castings.

In attendance: A. E. Mervine, manager, metal sales; W. P. Hardenbergh, assistant manager, metal sales; R. Davison, manager, market development division; R. G. Kenly, manager, rolled metal sales; E. Klein, E. K. Vaughan, C. R.

(Continued on page 56)

BRING YOUR REFRACTORY AND INSULATING PROBLEMS TO BOOTH A-14



SAVE 10% — 30% FUEL COST WITH SONITTEP INSULATION CEMENT

Sonittep Insulation Cement withstands temperatures up to 2000° F., sticks to hot or cold surfaces, and can be applied by unskilled labor. No reinforcing is necessary — and it will not crack, shrink or peel.

Besides open hearth furnaces, Sonittep Insulation Cement is recommended for annealing, forge, and electric furnaces — and many other uses.

MONOBRICK AND OTHER PETTINOS PRODUCTS

Monobrick is a refractory concrete used in place of firebrick, and will outlast firebrick four or five times at temperatures up to 3000° F. Other products:—Sonittep high temperature cements, plastic patch silicon carbide cement and foundry sands for every foundry requirement.

GEORGE F. PETTINOS INC.
PHILADELPHIA, PA.
USE THIS COUPON FOR FURTHER INFORMATION

Name
Company
Address
City
State

If you are interested in seeing the newest development in

BRONZE WELDING

See the demonstration we are conducting
SPACE A-78
NATIONAL METAL EXPOSITION
ATLANTIC CITY . . . OCTOBER 18-22.

NEW FLUXING PRINCIPLE

GASFLUX—FLUX BY INDUCTION

The GASFLUX Process, with the specially prepared flux, revolutionizes the process of bronze welding. The flux is inducted into the gas line and discharged through the tip, in the flame. This new process does away with the old method of dipping the welding rod into the flux—does a better job and does it more economically.

NO PICKLING—NO FUMES

Due to the even distribution of the flux, automatically regulated, no pickling or dipping is necessary. The weld is clean and has no hard residue.

A NEW TYPE OF WELD

This process speeds up the welding operation. It gives a tight, clean weld and every weld is uniform because the flux is automatically regulated just the same as the gas flow.

For detailed information, write

THE AUTOMATIC GASFLUX COMPANY
620 FRANKFORT AVE. CLEVELAND, O.

GASFLUX PROCESS

(Continued from page 54)

Maxon, S. E. Maxon, W. W. Broughton, H. W. Smith, R. E. Kellers, and A. F. Bremble.

NORTON CO., WORCESTER, MASS.

Booth A-1

Exhibiting (in operation): A variety of abrasive products used by industry. The variety of colors resulting from uses of various abrasive and bond combinations for grinding wheels and other abrasive products. By means of a conveyor belt a different group of abrasive products is brought before the audience every 20 seconds. These abrasive products include grinding wheels, many varieties of sharpening stones, abrasive paper and cloth, laboratory ware and refractories, rubbing bricks and sticks, cutting-off wheels, diamond wheels and non-slip flooring materials made of abrasives.

In Attendance: H. K. Clark, vice president and general sales manager; W. R. Moore, sales manager, abrasive division; W. T. Montague, manager, sales planning and development; A. B. Fritts, publicity manager; I. W. Stanton, exhibit department; Allan Seymour, district manager, Philadelphia; W. J. Bell, sales representative, Philadelphia; A. W. Gough, sales representative, Philadelphia; and J. D. Laughrey, sales representative, Philadelphia.

P

PARK CHEMICAL CO., DETROIT

Booth H-48

Exhibiting: A complete line of hardening and heat treating materials including liquid carburizers, polishing and buffing materials for steels and plated work and grain cement for setting up buffing wheels.

In attendance: J. C. Thompson, F. W. Faery, Jr., and J. N. Bourg, vice president and general manager.

PARKER-KALON CORP., NEW YORK

Booth B-21

Exhibiting (in operation): A new line being shown for the first time of cold-forged socket screws. Our complete line of hardened self-tapping screws and other modern fastening devices.

The functional characteristics of our self-tapping screws will be demonstrated by operating models.

In attendance: J. J. Mathe, field engineer; and J. M. Hoghland, field engineer.

THE PARTLOW CORP., NEW HARTFORD, N. Y.

Booth, Gas Section.

In attendance: Howard W. Partlow, Sr., president; Howard W. Partlow, Jr., vice president; and Alvin M. Stock, vice president.

THE PENTON PUBLISHING CO., CLEVELAND

Booth L-2

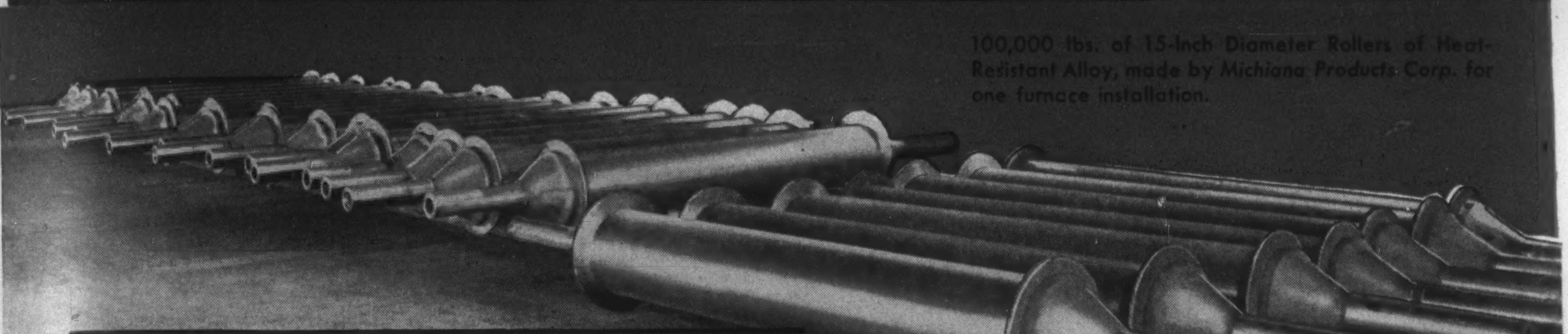
Exhibiting: Magazines: Steel, Machine Design, and Daily Metal Trade, and technical books.

In attendance: E. L. Shaner, editor of Steel, president of Penton Publishing Co.; Geo. O. Hays, business manager, Steel, vice president of Penton Publishing Co.; E. C. Kreutzberg, development manager, Steel; R. C. Jaenke, Central Western manager, Steel; S. H. Jasper, Pittsburgh manager, Steel; E. W. Kreutzberg, Eastern manager, Steel;

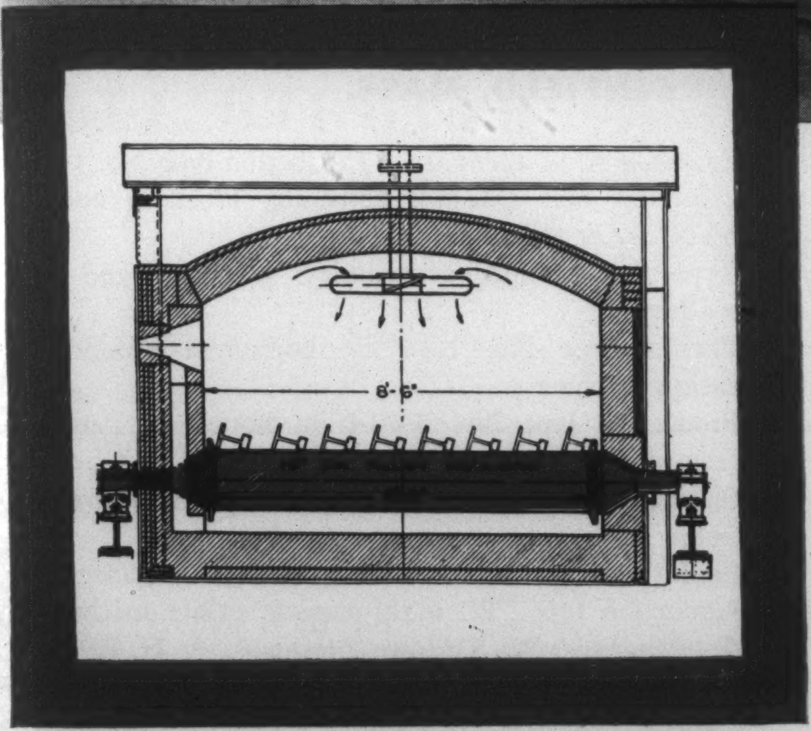
(Continued on page 58)

BETTER TRANSPORTATION REQUIRES BETTER RAILS

★ ***New Furnaces for Improving Rails — use MICHIANA Alloy Rollers***



100,000 lbs. of 15-Inch Diameter Rollers of Heat-Resistant Alloy, made by *Michiana Products Corp.* for one furnace installation.



COOPERATION BRINGS GREAT ADVANCES

Specialization leads to the greatest advances—but it also makes cooperation necessary. Railroad specialists call for better rails, for higher speeds, heavier trains—greater safety. . . . Steel men use their knowledge of steels to supply the newly created needs of the railroads—and in turn they cooperate with specialists in other lines to accomplish the results they demand. . . . *Michiana,* as specialists in the science of heat- and corrosion-resistant alloy castings—is ready to cooperate at all times with engineers and specialists in other lines to aid in today's and tomorrow's developments.

●

Sketch shows how *Michiana* Heat-Resistant Alloy Rollers are installed in normalizing furnace.

● In every field—periods occur when major developments are made.

Early progress, for example, in railroads began after the introduction of the air brake . . . now, the railroads have entered another era of rapid development—made possible by new and better materials, improved motive power—and better rails.

In one of the latest processes, the rails are improved by passing through a re-heating furnace—rollers of *Michiana* Heat-Resistant Alloy carrying the rails lengthwise through the furnace by rotation of the rollers.

Centrifugally Cast

Michiana casts the barrels of these rollers centrifugally, producing a tough, smooth-surfaced heat-resistant casting of uniform texture. Since the rails are fed through the furnace in continuous production, the importance of the roller dependability is obvious.

MICHIANA PRODUCTS CORPORATION
Michigan City, Indiana

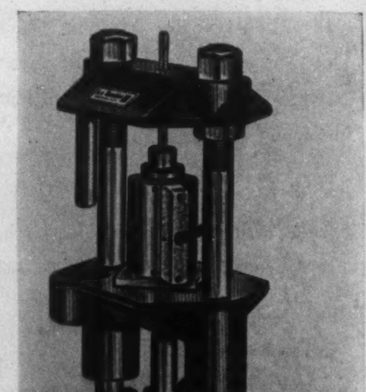
MICHIANA
HEAT-RESISTANT AND STAINLESS STEEL ALLOY CASTINGS

Transparent Mountings for Irregular Specimens

The dream of the Metallurgist became true with the introduction of an absolutely clear and transparent mounting material. See all sides of the specimen. Observe the location of a broken weld and study the very spot microscopically. Ideal for "The Electrolytic Etch."

Booth B-17 National Metal Show

The New A-B Specimen Press



Hundreds of Metallurgists using our press never again would go back to the old melting pot and ladle method for mounting metal specimens. For "extreme edge" studies, convenience in handling, speed and economy use the A-B Hydraulic Press and eliminate differential etching action frequently encountered with the fusible alloy.

A new service devoted to the Metallurgist.

Ask for your copy of "The Metal Analyst"
featuring new methods for the daily routine of the Metallurgist.

Adolph I. Buehler
OPTICAL INSTRUMENTS • METALLURGICAL APPARATUS
228 NORTH LA SALLE ST. • • CHICAGO ILL.

(Continued from page 56)

Byron Snell, Eastern representative, Steel; R. H. Smith, Eastern representative, Machine Design; I. H. Such, Eastern representative, Daily Metal Trade; B. K. Price, associate editor, Steel; Erle F. Ross, associate editor, Steel; and R. T. Mason, circulation manager, Steel.

HORACE T. POTTS CO., PHILADELPHIA

Booth G-72

Exhibiting (in operation): Parts made from Horace T. Potts' steels with particular emphasis on stainless, Carpenter matched tool steels and Elastuf steels.

There will be a tool steel selector in operation indicating the method of determining the various types of tool steels.

In attendance: Guy P. Bible, sales manager, M. E. Neeley, member of firm; A. L. Collins, assistant sales manager; Arthur Wells, sales engineer; F. A. Guba, sales engineer (stainless); C. M. Rusk, sales engineer (welding); S. L. Bateman, C. R. Spencer, T. I. Potts, N. B. Haas, R. A. Neeley, W. C. Spencer, C. L. Rutter, E. R. Potts, A. W. Ainsworth, manager tool and alloy division; L. D. Willis, salesman; W. H. Dunlap, salesman; D. C. Taylor, salesman; W. B. Jackson, salesman; and H. T. Potts, salesman.

PRODUCT ENGINEERING, NEW YORK

Booth G-1

Exhibiting: See "American Machinist."

PRODUCTION MACHINE CO., GREENFIELD, MASS.

Booth F-80

Exhibiting (in operation): Production type No. 101 patent centerless belt sanding, polishing, finishing and buffing machine for tubes, rod and bar work.

Type "S" production centerless polishing and finishing machine.

Peerless type No. 1—9 in. horizontal production surfacing machine.

Production type No. 2—14 in. horizontal peerless surfacing machine.

Production type No. 601—4 in. bench handy speed finisher.

Production type No. 606—6 in. peerless surfacer.

Production type "R" multi-purpose utility machine.

In attendance: W. S. Howe, president; A. H. Behnke, vice president; and T. A. Welch, superintendent.

PRODUCTS FINISHING, CINCINNATI

Booth H-65

Exhibiting: See "Modern Machine Shop."

THE PYLE-NATIONAL CO., CHICAGO

Booth H-44

Exhibiting: Turbo-generators, headlights, floodlights, plugs and receptacles and heavy duty electrical wiring devices.

In attendance: J. A. Amos, vice president and sales manager; C. P. McGinnis, representative; M. M. Connell, representative; R. S. Pollard, representative; F. M. Currie, special representative; and W. A. Wulle, manager, conduit fittings division.

R

THE RIVERSIDE METAL CO., RIVERSIDE, (Burlington County), N. J.

Booth F-10

Exhibiting: Beryllium copper in the form of sheet, strip,

(Continued on page 60)

"Ranger"

SAILS TO VICTORY

WITH

VANADIUM

STEEL RIGGING

When the Cup defender lost her mast in a trial sailing, Chromium-Vanadium Steel was selected for the fixed rigging. Horace T. Potts Co., Philadelphia, and Brown-Wales Co., Boston, supplied the ELASTUF TYPE. A Chromium-Vanadium Preheat Treated Steel and fabricators completed within twenty days a manufacturing job that would ordinarily have required twelve weeks. Photo: Courtesy of E. F. Houghton & Co.

Maximum strength with minimum weight . . . ability to absorb stresses and strains as 6,000 feet of mainsail billow with the breeze . . . absolute dependability — these were the specifications for the steel to be used in the stays and rigging of America's Cup defender.

Chromium-Vanadium Steel met all these requirements—as it is meeting thousands of severe specifications throughout industry — and the "Ranger" successfully defended the Cup with stays and rigging of Chromium-Vanadium Steel.

Are you looking for greater strength in a steel part? Would you like to reduce weight in a forging or casting? Have you a steel part that is giving trouble in service? Metallurgists of the Vanadium Corporation of America will be glad to help you.

•

VANADIUM CORPORATION OF AMERICA
420 LEXINGTON AVENUE, NEW YORK, N. Y.
Plants at Bridgeville, Pa., and Niagara Falls, N. Y.
Research and Development Laboratories, Bridgeville, Pa.

Vanadium Steels

Booth No H-20
NATIONAL
METAL
EXPOSITION

METALS VANCORAM ALLOYS

FERRO ALLOYS
of vanadium, silicon, chromium, and titanium, produced by the Vanadium Corporation of America, are used by steel makers in the production of high-quality steels.

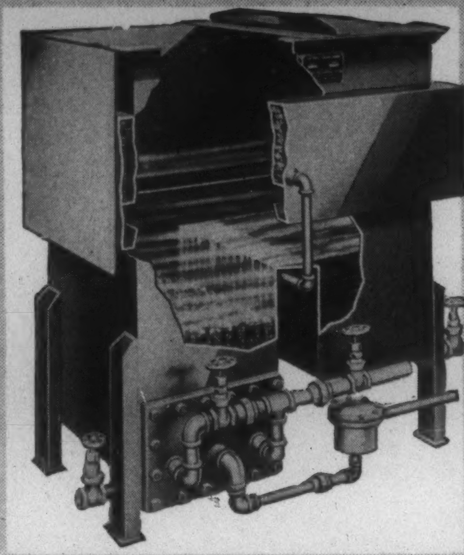
FOR STRENGTH · TOUGHNESS · DURABILITY

DOING BIGGER AND BETTER JOBS

In the Metal Cleaning Field

Plant managers everywhere are turning to Detrex Degreasers to solve their cleaning problems. Why? Because these scientifically designed cleaning units do *bigger and better jobs at lower cost.*

Detrex Degreasers help you reach the peak of cleaning efficiency! They always produce uniform results. Work emerges clean, warm, and dry—ready for subsequent operations. Muss, fuss, scrubbing, and extra drying are entirely eliminated.



Steam-heated Detrex Degreaser. Piping shown on front of machine is supplied by user.

Maximum efficiency — fewer operations, less handling expense, faster cleaning are some of the things you naturally expect — and will get with a Detrex Degreaser.

In your own shop, under your own operating conditions, a Detrex Degreaser will prove the most important factor in reducing costs and increasing production. You can always rely on them to do — *bigger and better cleaning jobs.*

While at the National Metal Show, see our exhibit in Booth H-35

DETROIT REX PRODUCTS COMPANY

Metal Cleaning Engineers—Solvent Degreasing—and Alkali Cleaning

13005 Hillview Avenue
Detroit, Michigan
New York Office: 130 W. 42nd St.
Chicago Office: 201 N. Wells St.
Cleveland Office: 812 Huron Road

(Continued from page 58)

bars and blanks together with a wide variety of applications. Up-to-date information on this heat-hardenable alloy will be available in printed form and attendants will be qualified to answer questions concerning this metal.
Phosphor bronze and nickel silver products and full information will also be available on these alloys.

In attendance: H. L. Randall, president; J. F. Hackett, vice president and general manager; R. J. Wheeler, metallurgist; H. S. Freynik, metallurgist; J. C. Blake, sales department; and J. V. Hackett, production department.

THE STANLEY P. ROCKWELL CO., HARTFORD, CONN.

Booth H-71

Exhibiting (in operation): "Rockwell" thermal analyzers for temperature ranges of 2400° F. down to that obtainable by solid carbon dioxide. Also "Rockwell" quenching agitators; "Rockwell" hardening tongs.

In attendance: Stanley P. Rockwell, vice president and general manager; William A. Stumpf, sales manager; Dudley W. Rockwell, sales department; and Kenneth Stumpf, in charge commercial heat treating department.

RUSTLESS IRON & STEEL CORP., BALTIMORE

Booth A-22

Exhibiting: Stainless steel bars and wire and products manufactured from these alloys.

In attendance: W. B. Pierce, sales manager; Stanley P. Watkins, manager, sales development; R. W. Dietrich, sales engineer; and S. E. Tuttle, sales engineer.

S

THE SENTRY CO., FOXBORO, MASS.

Booth F-1

Exhibiting (in operation): The new model "Y" electric high speed steel hardening furnace, which by eliminating water cooling and complicated atmospheric control systems offers economy and efficiency giving uniform, controlled hardening temperatures and heats to 2350° F. in less than an hour.

Constant, correct furnace atmosphere is maintained by the Sentry diamond block method of atmospheric control, assuring tools of maximum hardness and toughness free from scale, decarburization, or reduction in size on molybdenum, tungsten, and cobalt high speed steels. Even the sharpest cutting edges and corners are retained during hardening. Many sizes of Sentry diamond blocks will be on display.

Also showing the single and double tube Sentry high temperature (2550° F.) furnaces offering greater speed and precision for combustion analysis of stainless and other steels. The furnace and terminals are of rugged construction giving an average of more than five years' service. Highly efficient and economical to operate.

In attendance: A. A. Harvey, sales manager; and P. B. Crocker, treasurer.

SLEEPER & HARTLEY, INC., WORCESTER, MASS.

Booth H-17

Exhibiting (in operation): An improved selective type spring coiler known as the three-in-one machine. This

(Continued on page 62)

AIRPLANE and AUTOMOTIVE
HEAT EXCHANGERS
REFRIGERATION
PIPE and TUBING
ELECTRICAL
EXTRUDED METALS
AIR CONDITIONING
TANKS
MISCELLANEOUS PRODUCTION and REPAIRS

LOW TEMPERATURE BRAZING *approved!*

by more and more manufacturers

Low Temperature brazing's rapid growth started with the recent development of new alloys containing silver and a new low temperature flux.

These alloys, with melting and flow points not found in base metal brazing or welding metals, are being used by more and more manufacturers because they offer a fast reliable way of making strong, sound, corrosion resisting joints.

In production they reduce labor and save gas. Only a thin film is needed to get high strength and little or none is left outside the joint to be cleaned up in finishing. The cost per joint is low.

If you braze ferrous or non-ferrous metals you should know all the advantages low temperature brazing offers—how the alloys reduce rejects—solve the problem of joining dissimilar metals—and protect metals from damage by higher temperatures. Write us for details.

Try **THESE FAST WORKING ALLOYS**

SIL-FOS BRAZING ALLOY
EASY-FLO BRAZING ALLOY
HANDY SILVER SOLDERS

To get full benefit of the low melting points of these alloys be sure to use **HANDY FLUX**

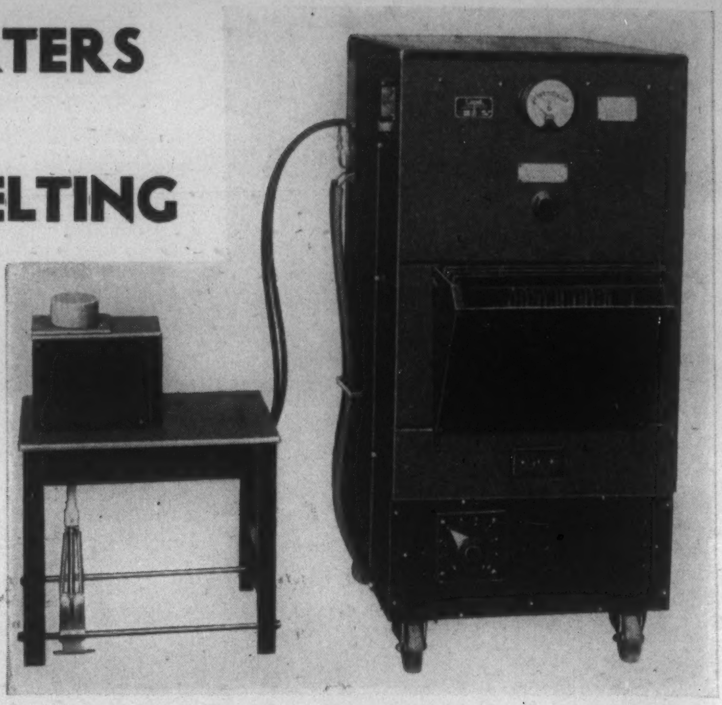
See **LOW TEMPERATURE BRAZING** demonstrated at our **BOOTH B35**
NATIONAL METAL EXPOSITION
Atlantic City
October 18-22

HANDY AND HARMAN · 82 Fulton St., New York
BRIDGEPORT, CONN. PROVIDENCE, R. I. TORONTO, CANADA

SEE BOOTH C-48 LEPEL

HIGH FREQUENCY CONVERTERS
for
INDUCTION HEATING & MELTING

A unit will be in operation to show you the many advantages and outstanding features of our equipment.



LEPEL HIGH FREQUENCY LABS INC.
39 W. 60 St. New York City

(Continued from page 60)

machine combines the accuracy of the segment type coiler, with the range of wire feed of the clutch type coiler and can also be used as a continuous coiler. It is driven by a variable speed drive with fully enclosed motor or with single pulley drive. Selective gearing, anti-friction bearings, hardened gears and shafts and multiple disk clutches make this machine more productive, easier to operate, more versatile, and more durable.

A No. 1 Series 610 will be in operation.

In attendance: William H. Blount, treasurer; Raymond F. Russell, general manager; Clayton Fisher, chief draftsman; Edward E. Franks, Jr., draftsman; and Alexander P. Lamitie, assembler.

SPENCER TURBINE CO., HARTFORD, CONN.

Booth B-71

Exhibiting (in operation): Centrifugal type Turbo compressors used for operating gas and oil-fired furnaces and industrial type vacuum cleaning. A slow speed multistage centrifugal type Turbo compressor supplying air for the gas furnaces operating during the exhibit. Also machine made up with special metal for use in handling corrosive acid fumes. The industrial type vacuum cleaner operating to show the effectiveness of cleaning in industrial plants, and handling large accumulations of litter.

In attendance: F. A. Wright, special representative; R. B. Richardson, district representative; Frank Martin, district representative; and R. A. Brackett, sales manager.

STEEL, CLEVELAND

Booth L-2

Exhibiting: See Penton Publishing Co.

STEEL PUBLICATIONS, INC., PITTSBURGH

Booth A-70

Exhibiting: The publications "Blast Furnace and Steel Plant," and "Heat Treating and Forging."

In attendance: Don N. Watkins, president; N. R. Moll, sales manager; H. Milton Reich, Western manager; T. B. Little, Eastern manager; Charles Longenecker, managing editor, "Blast Furnace and Steel Plant"; W. C. Kernahan, editor, "Heat Treating and Forging"; and F. B. Yeager, representative, Steel Publicatons, Inc.

STOODY CO., WHITTIER, CALIF.

Booth H-88

Exhibiting (in operation): A natural color motion picture film equipped with sound.

In attendance: J. R. Spence, metallurgist; W. M. Grant, secretary; and G. F. Staley, advertising department.

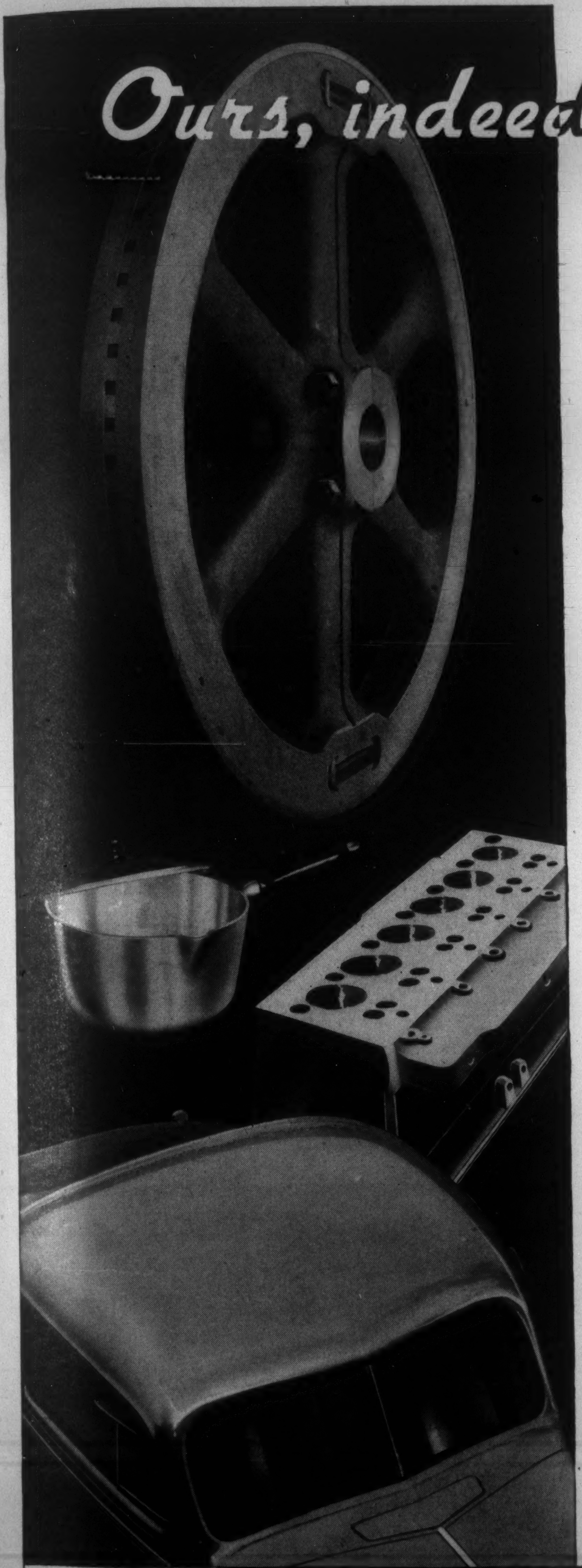
D. A. STUART OIL CO., LTD., CHICAGO

Booth B-48

Exhibiting: Intricate machined parts cut or drawn with Stuart metal working oils. Printed matter illustrating and describing lubrication problems of the day will be available to those seeking information, as well as complete information on the subject of hypoid gear lubricant and extreme pressure (EP gear and bearing lubricants for industrial and automotive applications).

In attendance: T. B. Langdon, vice president; W. M. Duncan, engineering department; W. H. Huelster, Western sales manager; J. Y. Umbarger, Philadelphia representative; A. J. McDuff, New England representative; T. C.

(Continued on page 68)



Ours, indeed, is the

AGE of ALLOYS

No longer is it the "Age of Steel"! For today even steels are fast joining the "alloy family" and gaining much in strength, machinability and endurance through the scientific inclusion of "alloying agents" during production.

Titanium plays a leading role in this new conception of metals. Not only in steels and the ferrous group, but in the great field of non-ferrous metals, Titanium alloys are paving the way to better products.

Titanium was first introduced commercially by TAMCO in 1906 in the form of TAM *Original* FCT (Ferro Carbon-Titanium), a cleansing and deoxidizing agent. Since then new developments have revealed the effectiveness of Titanium Compounds in improving quality and obtaining desired physical properties . . . Its stabilizing influence on carbon—its ability to age-harden copper—its prevention of intercrystalline corrosion in stainless steels—its "grain refining" effect—these and many other achievements of Titanium mark it as one of modern metallurgy's most useful servants.

Why not have a TAM Engineer call and outline the potential usefulness of Titanium to your output? TAM Metallurgical Alloys include TAM *Original* High Carbon FCT No. 78, TAM Medium Carbon FCT No. 35, TAM Low Carbon Ferro-Titanium (both 25% Ti and 40% Ti), TAM Foundry Ferro-Titanium, TAM Webbite (Alumino Titanium) and many others.

★ **Come to the TAMCO Booth F-76 at the National Metals Exposition in Atlantic City. TAM Engineers will be glad to "talk things over".**

TAM ZIRCONIUM TITANIUM PRODUCTS

THE TITANIUM ALLOY
MANUFACTURING CO.

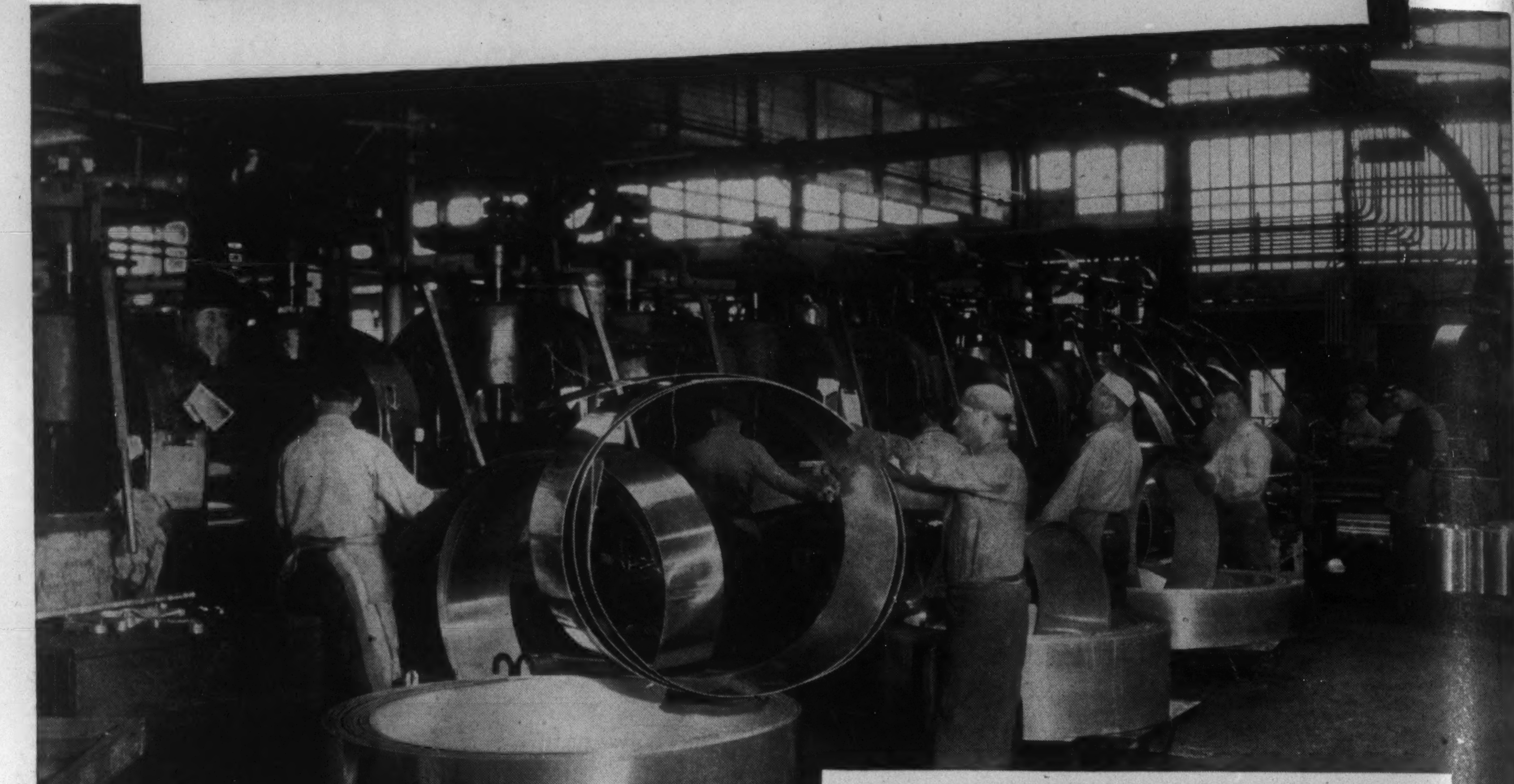
GENERAL OFFICES AND WORKS: NIAGARA FALLS, N. Y., U. S. A.
EXECUTIVE OFFICES: 111 BROADWAY, NEW YORK CITY

Representatives for the Pacific Coast: BALFOUR, GUTHRIE & CO., San Francisco, Los Angeles, Portland, Seattle, Tacoma . . . . *Representatives for Canada:* RAILWAY & POWER ENG. CORP., LTD., Toronto, Montreal, Hamilton, Winnipeg, Vancouver, Sydney . . . *Representatives for Europe:* T. ROWLANDS & CO., LTD., 23-27, Broomhall St., Sheffield, England

TAMCO

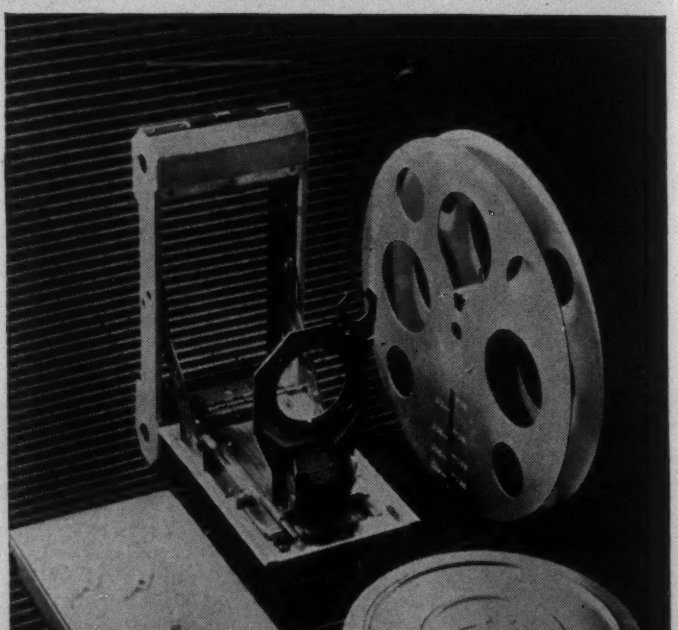
Better performance thru better metals

Famous World Travellers



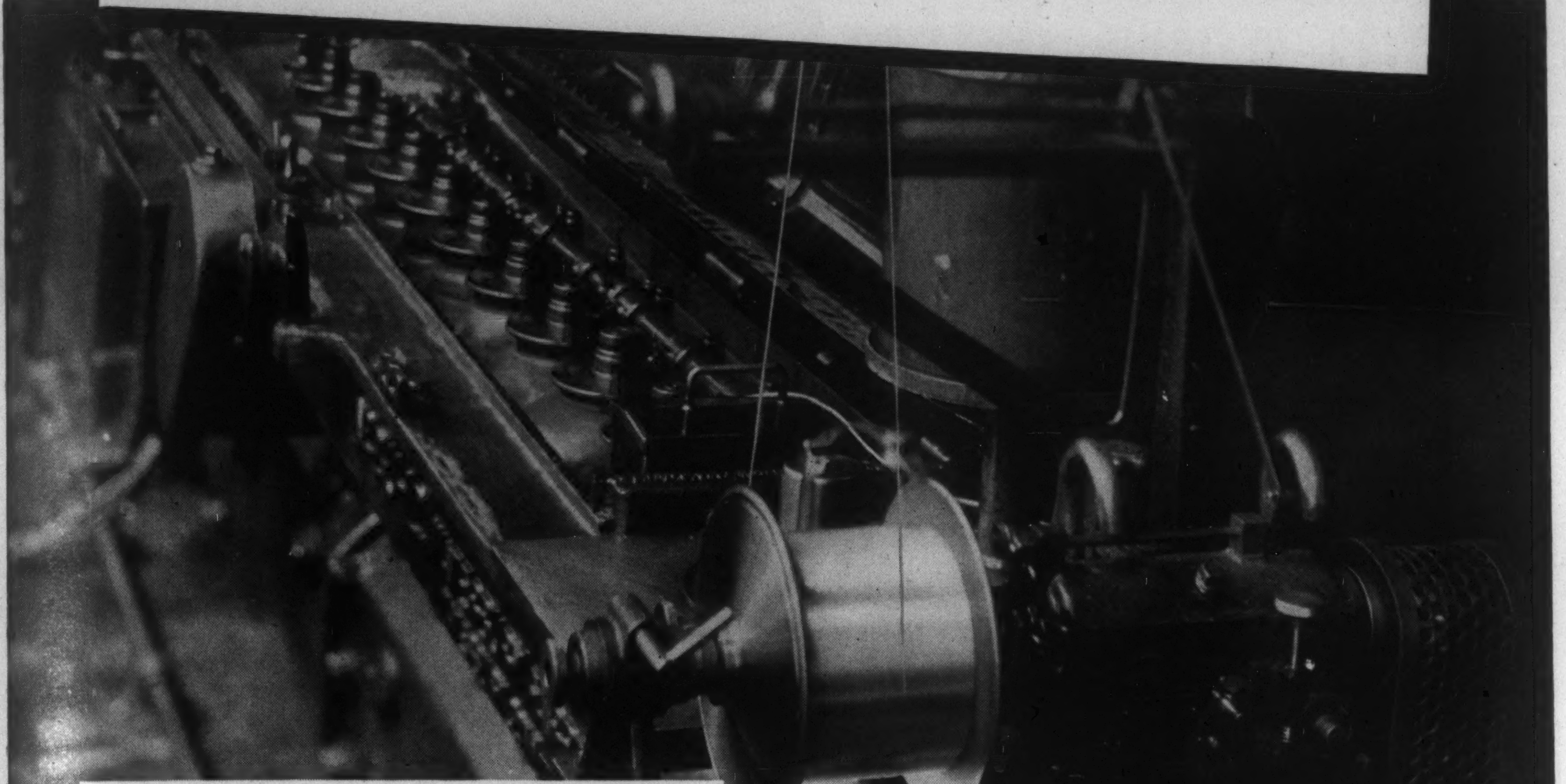
From this battery of finishing rolls, Alcoa Aluminum strip sheet is shipped far and wide to be made into thousands of different products. Manufacturers and users everywhere profit because of these properties of Aluminum; light weight, resistance to corrosion, strength to suit the use, ease of fabrication, and adaptability to a variety of finishes.

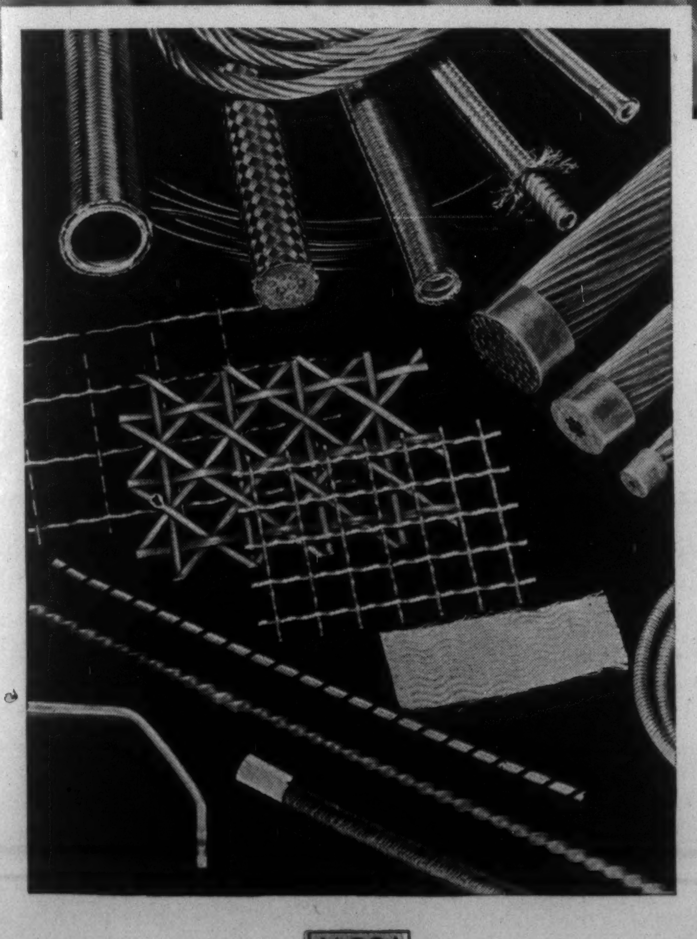
Familiar to picture takers the world over are the famous products shown here. Aluminum is an important contributor to reasons for their popularity. ALUMINUM COMPANY OF AMERICA, 2162 Gulf Bldg., Pittsburgh, Pa.



ALCOA · ALUMINUM

Aluminum Wire · its uses are countless





Mile after mile of Aluminum wire is produced hourly by this wire-drawing machine. A few products, made from wire and rod are pictured here.

Some utilize Aluminum because it is light in weight, a good conductor of electricity, highly resistant to corrosion, attractive in appearance. For others, alloys of Alcoa Aluminum provide the higher strength, hardness and toughness required in these wire products. ALUMINUM COMPANY OF AMERICA, 2162 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA · ALUMINUM

USE

LECTROMELT FURNACES

THE MODERN FOUNDRY EQUIPMENT

FOR

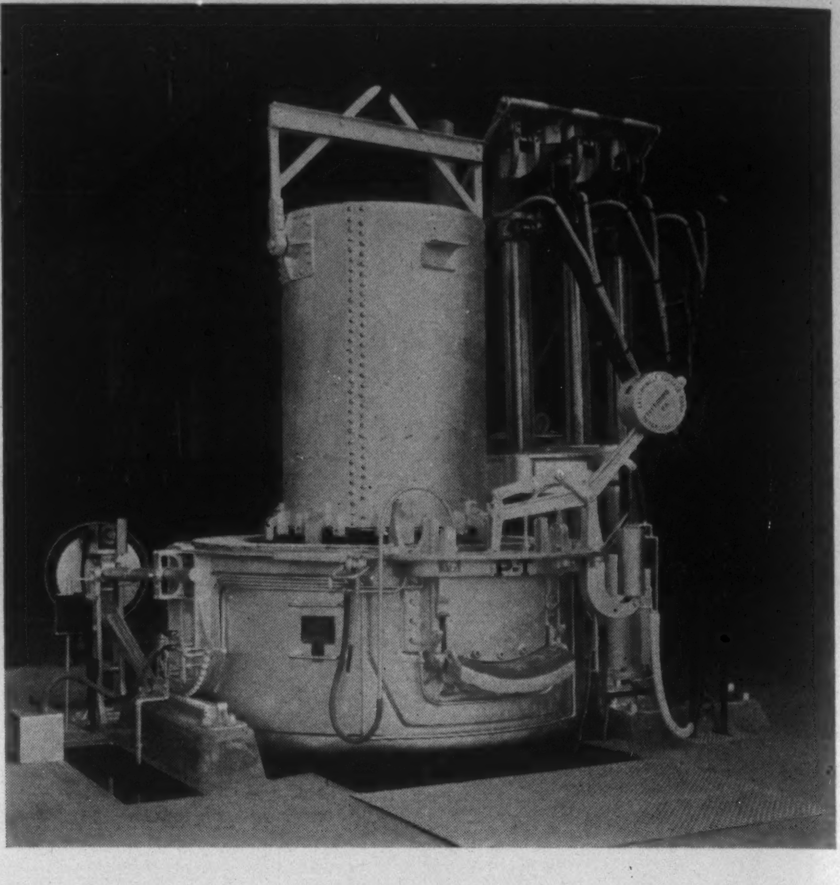
MELTING - REFINING - SMELTING

Alloy and Carbon Steels
Gray and Malleable Irons
Copper and Nickel and Alloys
Ferro-Alloys, Carbide and Special Products

Furnaces available in top-charge type with quick raise and swing roof—also in door charge type.

RAPID—ECONOMICAL—RUGGED

Built in Standard Sizes from
25 Pounds to 50 Tons Capacity



The illustration shows a top charge type LECTROMELT furnace being charged by a crane handled, drop bottom charging bucket. Note that the roof has been raised and swung aside for top charging.

PITTSBURGH LECTROMELT FURNACE CORP.

Foot of 32nd Street, Pittsburgh, Pa.—P. O. BOX 1257

(Continued from page 62)

Bradford, Southern Connecticut and New York city representative; and C. J. Nagel, New York state representative.

T

C. J. TAGLIABUE MFG. CO., BROOKLYN

Booth B-41

Exhibiting (in operation): Indicating, recording and controlling instruments for temperature, pressure, level, and flow. Also the latest Tag instrument developments.

A radically new Tag celectray recorder with a sensitive mirror galvanometer as the primary controlling element will be featured. In this design an inertialess beam of light takes the place of the customary metal boom or pointer. The beam of light from the galvanometer in moving on and off a phototube passes "the controlling edge" of a screen, thus operating relays which in turn control a reversing motor which drives the moving contact of the wheatstone bridge or potentiometer. This new instrument is noteworthy for its extreme simplicity, accuracy and speed, particularly in multiple point recorders. Tag photoelectrically balanced potentiometer pyrometer and other new types of control instruments will be shown for the first time. A complete line of pressure spring instruments of advanced mechanical construction in the new rectangular cases.

Tag magnetic clutch flow instruments, Tag industrial thermometers, Tag chemical thermometers, Tag hydrometers and oil testing instruments will be prominently featured.

In attendance: A. F. Rucks, general manager; C. O. Fairchild, director of research; W. C. Bennett, general sales manager; and L. Belluce, L. M. Hachenberg, W. Roberts, sales engineers; also L. Van Blerkom, pyrometer sales.

THE TIMKEN ROLLER BEARING CO., STEEL & TUBE DIVISION, CANTON, OHIO

Booth E-48

Exhibiting: Numerous products made from Timken steel and parts made from Timken graphitic steel.

In attendance: H. H. Timken, Jr., vice president; S. D. Williams, director of sales; W. E. Taggart, assistant manager of tube sales; Ralph Wilson, metallurgist; L. L. Ferrall, metallurgist; Martin Fleischmann, metallurgist; J. E. Fick, general superintendent; E. S. Hoopes, assistant general superintendent; F. R. Bonte, sales department; A. R. Adelberg, sales department; and W. P. White, district manager, Philadelphia.

THE TITANIUM ALLOY MFG. CO., NIAGARA FALLS, N. Y.

Booth F-76

Exhibiting: Samples of Titanium alloys and Zircon refractories. Photographs and actual castings showing the structure of Titanium treated steel, cast iron, and aluminum.

In attendance: G. F. Comstock, metallurgist; W. G. Wellings, chief development engineer; E. R. Starkweather, development engineer for cast iron; S. T. Harleman, development engineer; J. B. Bates, Titanite Alloys Corporation; D. A. Thompson, sales and development; E. L. Lasier, vice president; K. B. Thews, chief development engineer for refractories; and E. T. Goodridge, assistant to the president.

(Continued on page 70)

1st

ELECTRIC CERTAIN CURTAIN FURNACES
REGISTERED U.S. PAT. OFFICE

1st

"Certain Curtain" Leadership

**America's No. 1 Controlled Atmosphere Furnace,
first in performance and preference, announces**

a Radical Improvement in High-temperature Furnaces

**which will have far-reaching effects on
economy of operation and maintenance**

C. I. HAYES, INC. Providence

Makers of Electric Furnaces—Established 1905

**See it in operation at
the Metal Show, Booth B-31**

1st

OXYGEN-FREE **OFHC** HIGH-CONDUCTIVITY

REG. U. S. PAT. OFF.

COPPER

IS SUPERIOR
FOR ALL PURPOSES
(Produced by a Patented Process)

●

Ask either
your own fabricator or us
for the reasons

FIN TUBES

FINE WIRE

BI-POSTS FOR LAMPS

BRAIDED
CONDUCTORS

UNITED STATES METALS REFINING COMPANY
420 Lexington Avenue New York, N. Y.

(Continued from page 68)

THE TORRINGTON MANUFACTURING CO., TORRINGTON, CONN.

Booth H-9

Exhibiting (in operation): A new line of spring making equipment complete with spring coiling and winding machinery. Engineers experienced in the design of spring making equipment have developed in these machines high speed production, with the result that the spring machinery announced at the exposition possesses decidedly novel features as contrasted with earlier designs.

Backed by its wide experience in this field, the company has now entered into the field of spring manufacture with a complete line of spring coiling and winding machinery. A few of the features of the new designs are: Simple feed adjustment, safety hand wheel, fully enclosed compact design and built-in motor; ample wire and coil capacities in each machine; Timken roller bearing equipped; convenient, accessible controls for pitch, diameter, cut-off, etc., square clean cut ends; production speed variable either by change gears or standard variable speed unit; wire feed on clutch type adjustable through fixed center change gears or sliding gear box. The line includes segment and clutch type coilers in 8 sizes, covering a range from .006 inch to 3/8 inch diameter wire and torsion spring machines in 4 sizes, covering a range from .006 inch to 1/4 inch diameter wire.

In attendance: Henry G. Ellis, president; Alexis Doster, vice president and secretary; Henry Nigro, Arthur Nigro, C. R. Bergevin, and Eric Lejeski.

U

UNITCAST CORP., TOLEDO, OHIO

Booth C-91

Exhibiting: Alloy steel castings of various types, both in rough and finished condition.

In attendance: R. F. Tillman, president; J. L. Tillman, vice president; L. C. Mertz, sales manager; Floyd Brown, inspection engineer; V. E. Zang, metallurgical engineer; H. H. Serrels, metallurgist; and E. H. Fisher, advertising manager.

W

WHEELCO INSTRUMENTS CO., CHICAGO

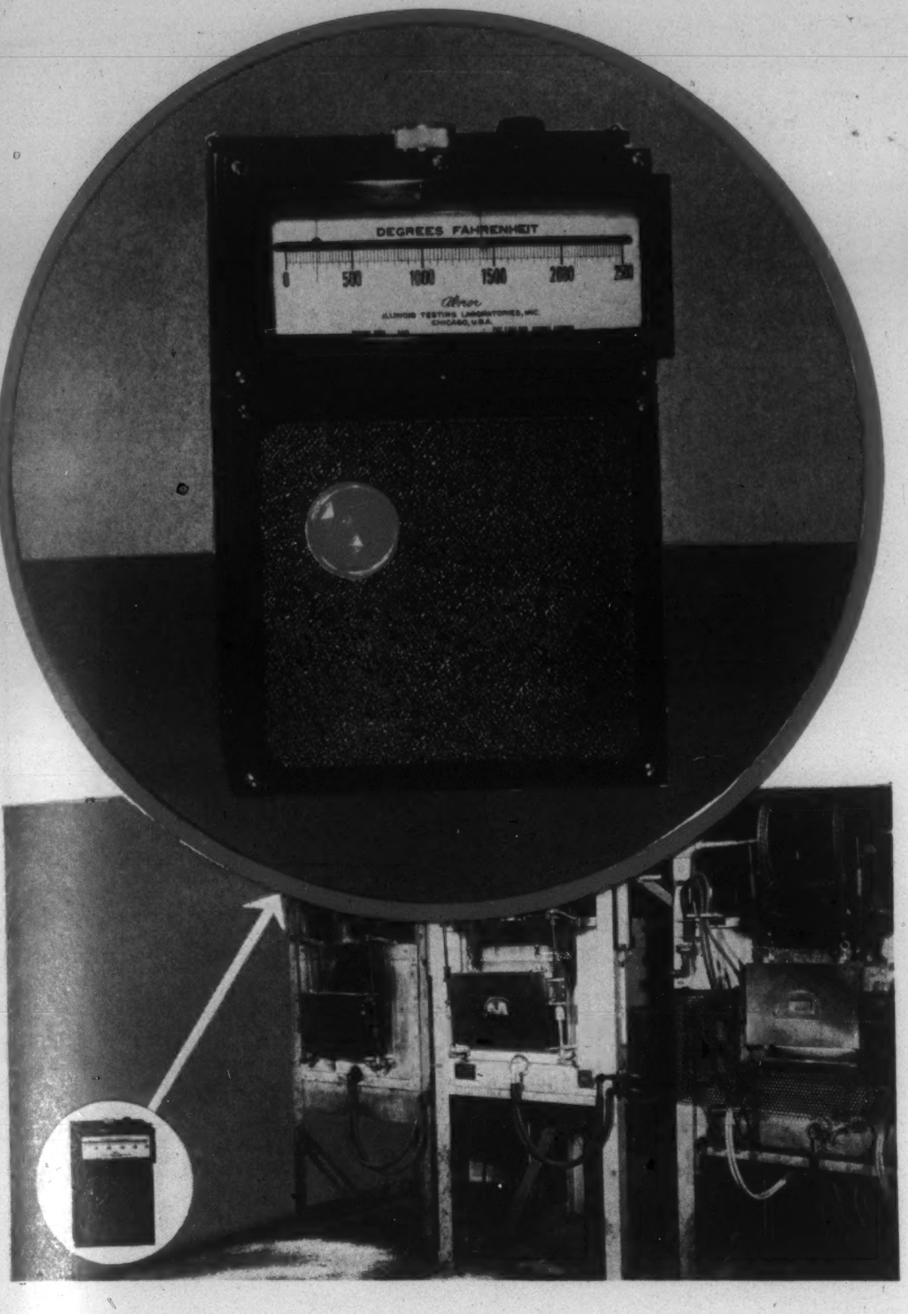
Booth B-84

Exhibiting (in operation): The following equipment will be operating on special panel boards designed to best show the operating features and construction: Capacitrol; Limitrol; Proportioning Control; and Flame-otrol. Also a complete line of Wheelco pyrometers, both wall and portable type as well as other small items manufactured by this company.

The new Wheelco portioning controller will be introduced for the first time at the Atlantic City show.

In attendance: Leo Wheeler, president; Richard Schoenfeld, sales manager; George Wheeler, secretary and treasurer; Ted A. Cohen, chief engineer; George Keller, sales representative; Wm. Printz, sales representative; and Clarke Joy, sales representative.

(Continued on page 74)



Announcing
THE NEW
"Alnor"
Pyrometer Controller

U. S. Patent No. 1,861,929
June 7, 1932. Others Pending.

First shown at the 1936 National Metal Show, the Alnor Pyrometer Controller is now offered after more than a year's continuous successful operation in actual shop service.

HERE is a very moderately priced simplified Controller, which operates on the electronic principle similar to a radio.

It controls electric heat directly, or oil or gas fired units with motorized or solenoid valves. A red bull's eye indicates whether the heating unit is on or off.

If you are unable to attend the National Metal Show at Atlantic City, write for folder, which gives complete details.

It has no motors, no depressor bars, no contacts to stick or become inoperative. The temperature indicating pointer is free at all times to give continuous indication and hair-line control.

See this new Controller and other "Alnor" Pyrometers

At

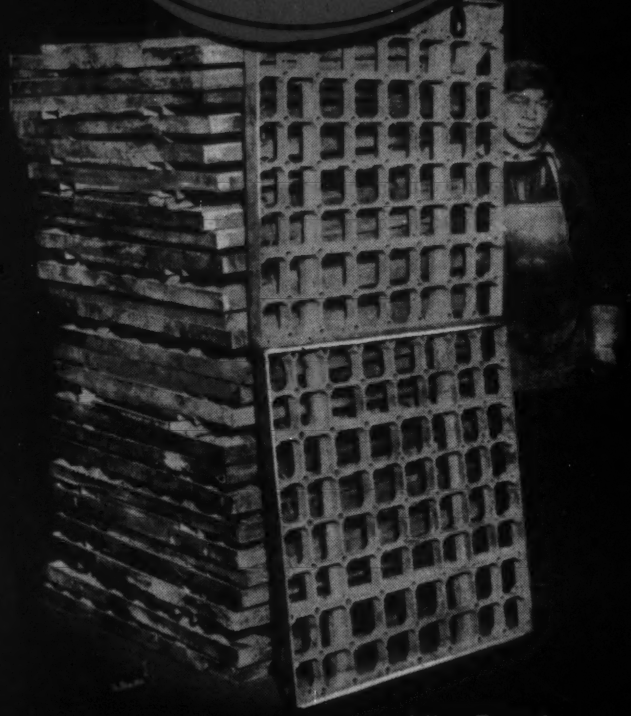
BOOTH B-83

National Metal Exposition
Atlantic City, Oct. 18-22, 1937

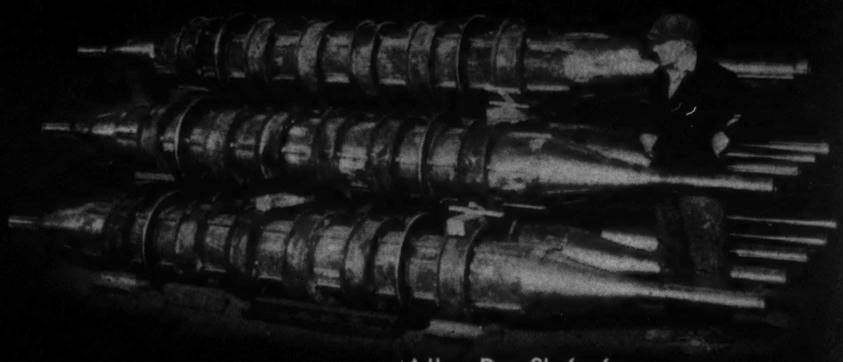
ILLINOIS TESTING LABORATORIES, INC.
425 No. LaSalle St. Chicago, Ill.

NATIONAL
ALLOY CASTINGS
MAKE CONVEYORS
LAST LONGER

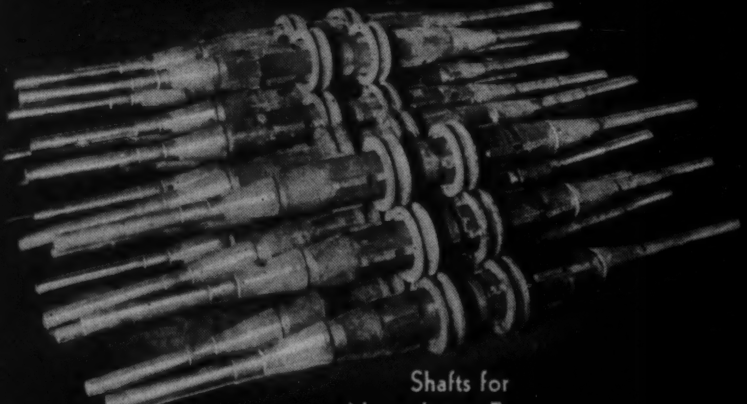
EXTREMELY LONG LIFE IN HIGH TEMPERATURE SERVICE HAS MADE THE USE OF NATIONAL ALLOY CASTINGS A DEMONSTRATED ECONOMY



Alloy Trays for
Heat Treating Furnace



Alloy Dry Shafts for
Supporting Conveyor
Chains

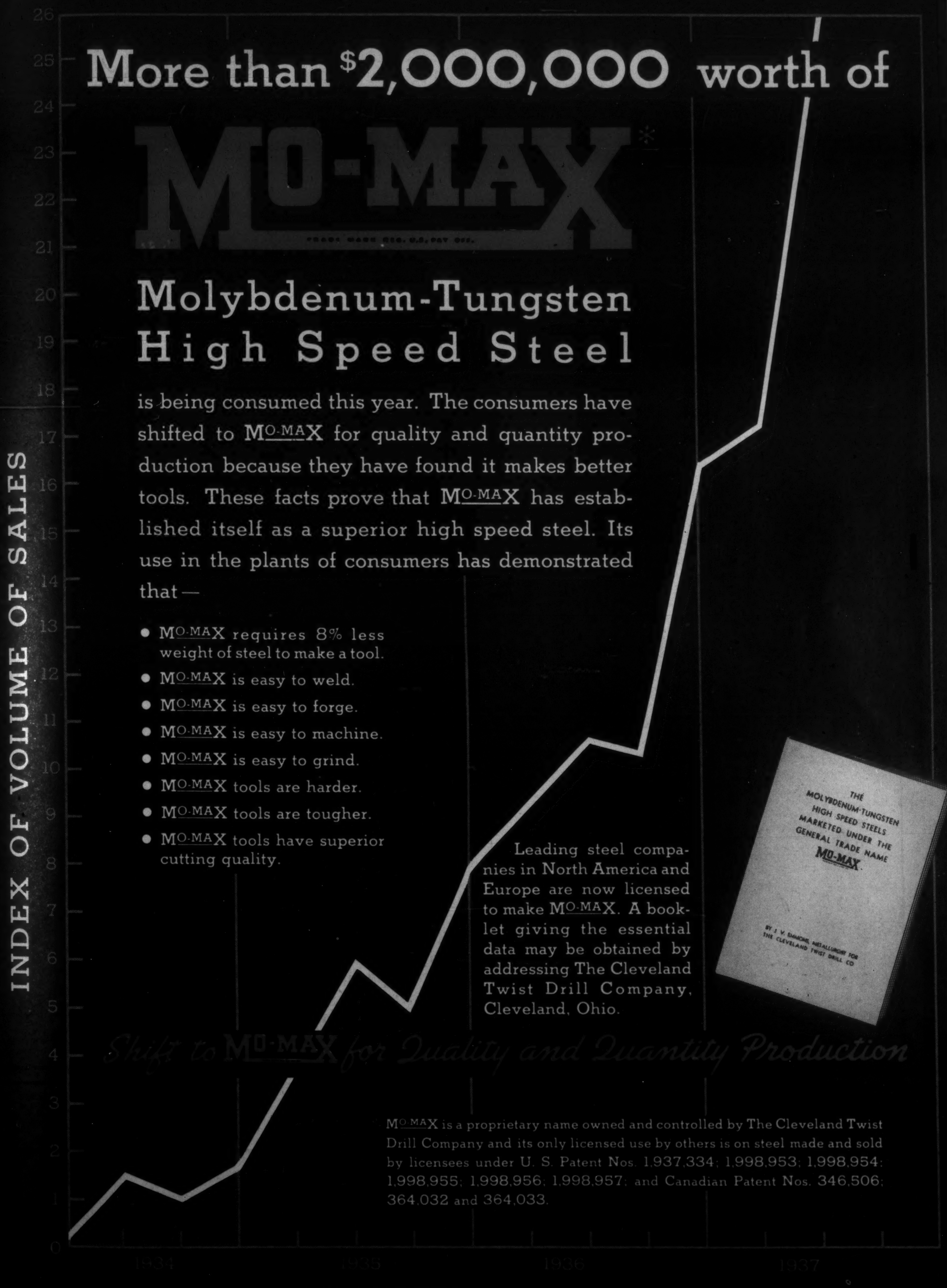


Shafts for
Normalizing Furnace

Shafts for Heat Treating
Furnace

SPECIFY NATIONAL ALLOY CASTINGS FOR ALL USES WHERE THE ULTIMATE RESISTANCE TO HIGH TEMPERATURES, CORROSION OR ABRASION IS NECESSARY

NATIONAL ALLOY STEEL CO.
BLAWNOX, PA.



More than $2,000,000 worth of

MO-MAX*

TRADE MARK REG. U.S. PAT. OFF.

Molybdenum-Tungsten
High Speed Steel

is being consumed this year. The consumers have shifted to MO-MAX for quality and quantity production because they have found it makes better tools. These facts prove that MO-MAX has established itself as a superior high speed steel. Its use in the plants of consumers has demonstrated that—

- MO-MAX requires 8% less weight of steel to make a tool.
- MO-MAX is easy to weld.
- MO-MAX is easy to forge.
- MO-MAX is easy to machine.
- MO-MAX is easy to grind.
- MO-MAX tools are harder.
- MO-MAX tools are tougher.
- MO-MAX tools have superior cutting quality.

Leading steel companies in North America and Europe are now licensed to make MO-MAX. A booklet giving the essential data may be obtained by addressing The Cleveland Twist Drill Company, Cleveland, Ohio.

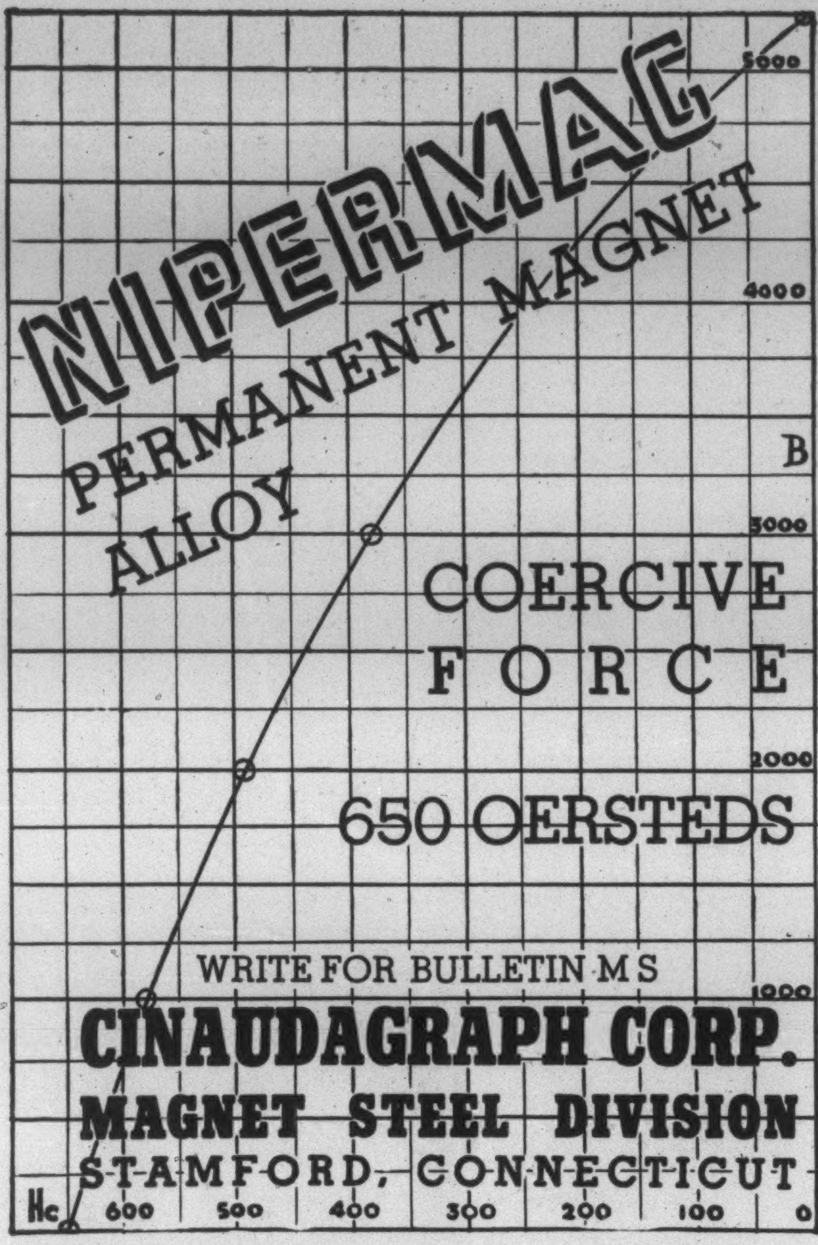
THE
MOLYBDENUM-TUNGSTEN
HIGH SPEED STEELS
MARKETED UNDER THE
GENERAL TRADE NAME
MO-MAX.

BY J. V. EMMONS, METALLURGIST FOR
THE CLEVELAND TWIST DRILL CO

Shift to MO-MAX for Quality and Quantity Production

MO-MAX is a proprietary name owned and controlled by The Cleveland Twist Drill Company and its only licensed use by others is on steel made and sold by licensees under U. S. Patent Nos. 1,937,334; 1,998,953; 1,998,954; 1,998,955; 1,998,956; 1,998,957; and Canadian Patent Nos. 346,506; 364,032 and 364,033.

SALES OF MO-MAX BY 3 MONTH PERIODS


NIPERMAG
PERMANENT MAGNET
ALLOY
COERCIVE
FORCE
650 OERSTEDS
WRITE FOR BULLETIN MS
CINAUDAGRAPH CORP.
MAGNET STEEL DIVISION
STAMFORD, CONNECTICUT

2000° FAHRENHEIT

STABILO
Othello
Swano
6721
STABILO
SWAN

. . . yet markings made with this great metal pencil are still legible!

Every metallurgist knows how difficult it is to retain markings on work subjected to crucible heat. Here is a pencil which America's leading plants have endorsed enthusiastically, because its sharp, vivid markings remain legible till the metal itself melts. 2000 degrees and more . . . an everyday test that STABILO pencils meet unflinchingly! Isn't this the pencil you've been looking for?

Available in GOLD as well as SILVER
Write for samples and prices

Swan Pencil Co. Inc.
221 Fourth Avenue, New York, N. Y.

(Continued from page 70)

WIEDEMANN MACHINE CO., PHILADELPHIA

Booth A-46

Exhibiting (in operation): A 12-inch throat turret punch with 12 punches and dies up to 1 inch diameter mounted in a revolving turret.

A turret punch for 24 inch wide sheets with 12 different sizes of punches always instantly available.

A type R-4 twelve station deep throat turret punch in three standard throat depths of 18, 24, and 28 inches.

Type R-2 twelve inch throat turret punch. Capacity of 15,000-80,000 pounds pressure. Type 6-B turret punch, $2\frac{3}{4}$ inch depth of throat. Capacity of $\frac{1}{2}$ inch diameter hole in $\frac{3}{16}$ inch thick machine steel.

Type R-4P motor driven deep throat turret punch in 18, 24, and 28 inch standard throat depths.

Type R-5 heavy duty motor driven turret punch with 18 inch throat with 12 station turret or type R-6 in 30 inch throat with 15 station turret.

In attendance: Ernest J. Rollings, superintendent; Theo A. Wiedemann, sales manager; and Chas. R. Gessler.

WILSON MECHANICAL INSTRUMENT CO., INC., NEW YORK

Booth C-50

Exhibiting (in operation): "Rockwell" hardness tester; "Rockwell" superficial hardness tester for thin material and superficially hardened surfaces; adapters for hardness testing the inner cylindrical surfaces of rings and cylinders; and latest work support accessories for the "Rockwell" tester.

In attendance: V. E. Lysaght, sales manager; D. F. Sklar, development engineer; A. C. Wilkins, New York representative; R. B. Coleman, Philadelphia representative; and J. P. Roberts, Buffalo, Cleveland, Pittsburgh representative.

Z

CARL ZEISS, INC., NEW YORK

Booth G-80

Exhibiting (in operation): Metallograph Neophot for bright field, dark field, and polarized light observation of metal specimens at all suitable magnifications.

Spectrograph "Qu-24" for the quantitative and qualitative analysis of metals in the industrial laboratories. The instrument is well adapted for this purpose because it requires no particular experience, skill or complicated adjustments.

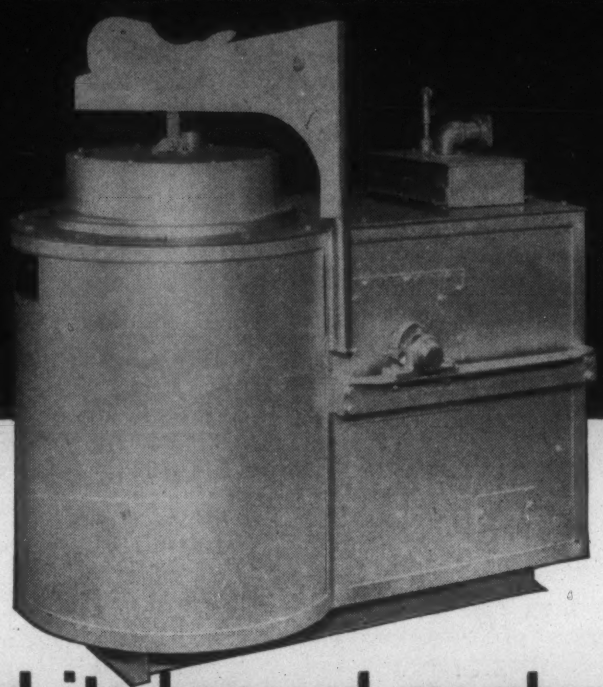
Spectrum line photometer for evaluating spectrograms in quantitative analysis.

Spectrum projector for evaluating spectrograms in qualitative analysis.

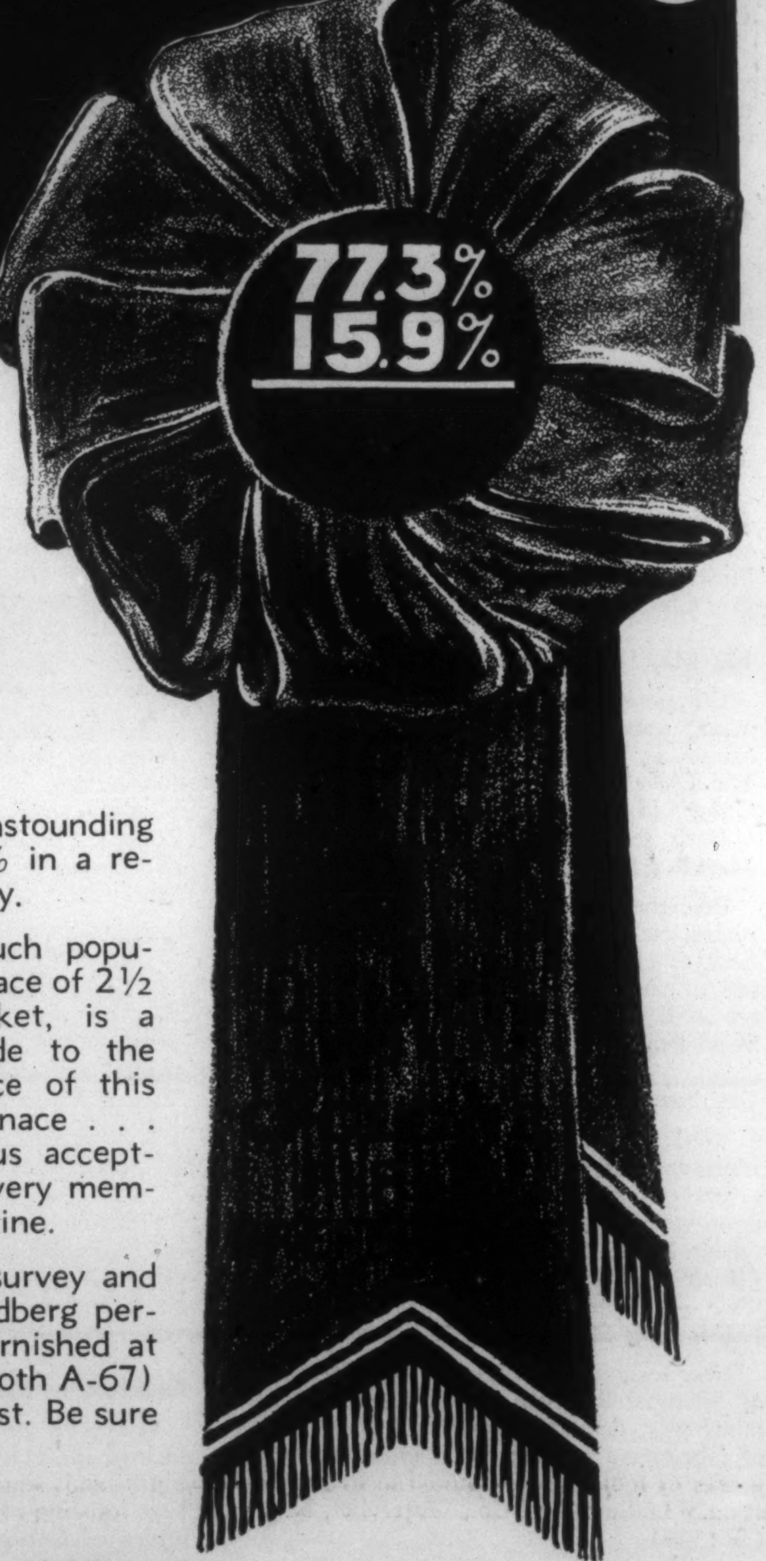
Feussner sparking apparatus, patented, keeps at a constant the energy emanating from a source of light. This is necessary in order to arrive at a truly quantitative analysis.

In attendance: V. M. E. Koch, vice president; S. Meyer, vice president; E. Sobotka, salesman; and W. G. Kramer, salesman.

The LINDBERG Line



Cyclone Tempering Furnace — Electric and Gas Fired

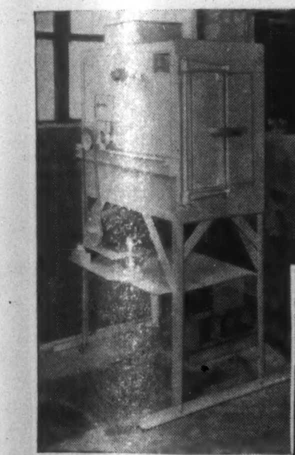


and its honored member CYCLONE

was accorded the astounding preference of 93.2% in a recent broadcast survey.

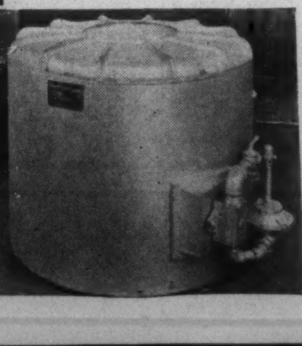
That it achieved such popularity in the short space of 2½ years on the market, is a tribute of the trade to the splendid performance of this experience-built furnace . . . and this spontaneous acceptance is shared by every member of the Lindberg line.

Full details of the survey and other proofs of Lindberg performance will be furnished at the Metal Show (Booth A-67) . . . or sent on request. Be sure to ask for them.

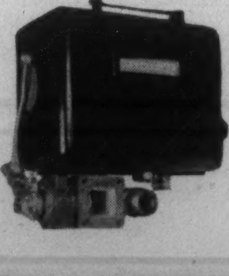


Box Type Cyclone for Toolroom Service

Laboratory Cyclone Furnace for Small Parts



Screw Type Pot Furnace Spiral Flame Travel



Throttling Control for Gas Fired Furnaces

Lindberg Control For Electric Furnaces

Lindberg Engineering Co.

218 N. LAFLIN STREET

Offices in Principal Cities
Canada—Williams & Wilson, Ltd.

CHICAGO, ILLINOIS

Manufacturers' Literature

Prefinished Colored Metals

Tint-Metal products (lustrous colored sheet metal or metal board) are described in this folder, which contains actual sample on bases of tin-plate, steel and zinc. American Nickeloid Co., Peru, Ill. (B 1392)

Forging Presses

Bulletin No. 300 features high-speed steam-hydraulic forging presses for working heavy forgings to the close degree of accuracy required in the heavy metal fabricating industries. Chambersburg Engineering Co., Chambersburg, Pa. (B 1393)

Weathering Tester

The Weather-ometer, for the accelerated determination of natural weathering effects on protective coatings, is described in an illustrated booklet. Atlas Electric Devices Co., Chicago, Ill. (B 1394)

Mo-Max High Speed Steels

Composition, tool performance, heat treatment, operations and difficulties are discussed in a booklet devoted to Mo-Max. The Cleveland Twist Drill Co., Cleveland, Ohio. (B 1395)

Marking Pencil for Hot Metal

Permanent identification of ingots, bars, plates, etc., that must be heated above a red heat, is claimed to be possible through the use of this pencil, the marks from which are not destroyed by high temperatures. Swan Pencil Co., N. Y. (B 1396)

Gas Burner Equipment

Well illustrated 65 page catalog shows representative installations of gas burners in several fields, and describes equipment for improved utilization of manufactured gas. Ensign-Reynolds, Inc., New York, N. Y. (B 1397)

Fabricating Stainless

New technical publication "The Working of Silcrome Stainless Steel" links up, in a novel way, detailed instructions on methods of fabricating stainless with information on grades of tool steel best suited to each operation. Ludlum Steel Co., Watervliet, N. Y. (B 1398)

Metal Hydrides

Reprints of a series of articles by P. P. Alexander on "The Hydride Process," in Metals and Alloys, are available. History, production and uses of metal hydrides are discussed. Metal Hydrides, Inc., Clifton, Mass. (B 1399)

Silicon Bronzes

Attractive catalog gives general information, forms available and abundant technical data on Herculoy, described as combining the corrosion resistance of copper with the strength of steel. Table of physical and chemical properties of many other copper alloys given. Revere Copper and Brass, Inc., New York, N. Y. (B 1400)

2900 Deg. Combustion Tubes

Refractory combustion tubes, claimed to be serviceable in laboratory furnaces up to 2900 deg. F. are described in this folder of the Burrell Technical Supply Co., Pittsburgh, Pa. (B 1401)

Carburizing Unit

The Hevi-Duty Carburizer is an electric furnace unit using the Carbonol (carefully blended gas-producing oil) process, which is claimed to provide uniform case depth, improvement in quality, cleanliness and other advantages. Hevi Duty Electric Co., Milwaukee, Wis. (B 1402)

Ampco Metal

Engineering data sheet No. 44 discusses the industrial aspects of corrosion and describes corrosion-resisting properties and applications of this alloy. Ampco Metal, Inc., Milwaukee, Wis. (B 1403)

Low-Alloy, High-Tensile Steel

Mechanical and corrosion-resisting properties and applications of Cor-Ten, a ductile low-carbon, chromium-copper-silicon-phosphorous steel, are given in this 67 page catalog. Exceptionally high yield and tensile strength are claimed. United States Steel Corp., New York, N. Y. (B 1404)

A. C. Welding Electrodes

The advantages, applications and information for ordering of three types of "non-premium" A. C. type Crucible Weld electrodes are described in this bulletin of Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa. (B 1405)

Insulating Materials

"Barriers to Industrial Waste" is the title of this pocket-size, well-indexed catalog covering all types of insulation, from felts to brick and refractory cements. Johns-Manville, New York, N. Y. (B 1406)

Graphite in the Foundry

Graphites are used in the foundry for facings and blackings, in the making of crucibles and similar refractory products, in heat resisting black paints, etc., according to folder of George F. Pettinos, Philadelphia, Pa. (B 1407)

Metal Working and Treating Problems

The current issue (Vol. 2, No. 1) of *Research, Illustrated* includes interesting articles on cutting oils, heat treatment, quenching oils, salt baths and inhibitors. E. F. Houghton & Co., Philadelphia, Pa. (B 1408)

Foundry Crucibles

The history and development, types available, and typical applications and installations of graphite crucibles for foundry practice are given, together with helpful data for foundrymen, in the catalog of Bartley Crucible and Refractories, Inc., Trenton, N. J. (B 1409)

Electronic Pyrometer Controller

The "Alnor" pyrometer controller provides automatic temperature control of heat-treating furnaces, melting pots, and other heating devices at a definite, predetermined point. Instrument operates electronically. Illinois Testing Laboratories, Inc., Chicago, Ill. (B 1410)

Berwick Forging Heaters

These heaters employ the direct electric resistance method to heat the metal, and feature temperature control by photocell. Advantages claimed are speed, uniformity, absence of distortion, and economy. American Car and Foundry Co., New York, N. Y. (B 1411)

Alloy Castings

Illustrated folder shows variety of intricate castings made in "National" oxidation, corrosion and abrasion resisting alloys. National Alloy Steel Co., Blawnox, Pa. (B 1412)

Economical Annealing

Lavite furnaces are claimed to fit into a varied annealing schedule by providing stored heat so that metals with successively lower annealing temperatures may be treated throughout a given day. Bellis Heat Treating Co., Branford, Conn. (B 1413)

Optical Instruments

Spectrometers and accessories, polariscopes, lenses, lens testing apparatus, light sources and other optical instruments are described and illustrated. Gaertner Scientific Corp., Chicago, Ill. (B 1414)

Controlled Reversal of Heating Operations

Type 2700 Timers automatically function any desired group of signals, valves and dampers to accomplish the actual reversal of the furnace. Automatic Temperature Control Co., Philadelphia, Pa. (B 1415)

Control System

Bulletin No. 460T describes a coordinated control system for industrial processes. The Bristol Co., Waterbury, Conn. (B 1416)

Double Chamber Melting Furnace

Monarch-Rockwell furnaces, with double heat-exchanging chamber construction fired with gas or oil, are described and illustrated. Monarch Engrg. and Mfg. Co., Baltimore, Md. (B 1417)

Hammer Boards

The features of Durock and Silverock hammer boards, claimed to provide higher resistance to warping, longer service at lower cost, and faster hammer operation, are discussed. Irwin Lumber Co., Erie, Pa. (B 1418)

Magnetic Separation in the Foundry

Interesting applications of the Dings high intensity separators for magnetic removal of metals from sand, abrasive grains, etc., are described. Dings Magnetic Separator Co., Milwaukee, Wis. (B 1419)

MANUFACTURERS' LITERATURE

Testing Machines

The Southwark-Emery line of testing equipment is featured in a fully illustrated bulletin, containing charts, curves and technical data. Baldwin-Southwark Corp., Philadelphia, Pa. (B 1472)

Automatic Optical Pyrometer

Bulletin No. 91-1 is devoted to the Optimatic sighting tube, the power supply unit and the instruments which comprise the Optimatic System for measuring surface temperatures of hot bodies in motion or at rest. The Brown Instrument Co., Philadelphia, Pa. (B 1473)

Buffs and Compositions

Bulletin No. BC-104 contains pictures of the various types of buffs and compositions as well as a description of their uses. Hanson-Van Winkle-Munning Co., Matawan, N. J. (B 1474)

Ground Shafting

Turned, ground and polished shafting and small diameter drawn, ground and polished bars are discussed in a leaflet illustrating the modern production methods used in manufacturing them. Bliss & Laughlin, Inc., Harvey, Ill. (B 1475)

Retorts for Gas Carburizing

Rotary and stationary retorts are discussed in a leaflet which gives different analyses which may be used for varying conditions. The Calorizing Co., Pittsburgh, Pa. (B 1476)

High Temperature Combustion Furnaces

Single and double tube laboratory furnaces, provided with Globar elements producing temperatures up to 2550 deg. F., are described in a bulletin from the Burrell Technical Supply Co., Pittsburgh, Pa. (B 1477)

Industrial Air Cleaning

Bulletin No. 904 discusses the use of electrostatic precipitators for air cleaning. The Pangborn Corp., Hagerstown, Md. (B 1478)

Surface Hardening by Induction

The TOCCO Process is discussed in an illustrated leaflet of The Ohio Crankshaft Co., Cleveland, O. (B 1479)

Chapmanizing

A pamphlet devoted to Chapmanizing compares it to nitriding and carburizing. The Chapman Valve Mfg. Co., Indian Orchard, Mass. (B 1480)

Electric Furnaces

Catalog No. 23 devoted to the Ajax Wyatt electric furnaces, claims highest possible thermal efficiency and automatic circulation of metal bath among their advantages. Ajax Electric Furnace Corp., Philadelphia, Pa. (B 1481)

Braze-Rite Furnace

This furnace developed principally for brazing sintered carbide cutting tools, provides for localized heat to be applied only to the portion of the tool to be brazed. Firth-Sterling Steel Co., McKeesport, Pa. (B 1482)

Rapid Moore Lectromelt Furnaces

Bulletin No. TC describes patented lift and swing-aside-roof type quick top-charge electric melting and refining furnaces. Pittsburgh Lectromelt Furnace Corp., Pittsburgh, Pa. (B 1483)

Molybdenum in Steel

Data on different types of molybdenum steels are given in an illustrated booklet of the Climax Molybdenum Co., New York, N. Y. (B 1484)

Ajax-Northrup Induction Furnaces

Bulletin No. 11, superseding Bulletin No. 6, is devoted to the large coreless induction furnaces of the Ajax Electrothermic Corp., Trenton, N. J. (B 1485)

Aluminum

An attractive booklet "Aluminum in Shopfitting and Display" contains a section devoted to practical points on use and fabrication. Arthur Seligman & Co., Inc., New York, N. Y. (B 1486)

Liquitol

Bulletin A1-16-A deals with the use of Liquitol for iron and steel castings and ingots. Alpha-Lux Co., Inc., New York, N. Y. (B 1487)

Stainless Steels

This company claims that its materials are manufactured by special processes providing a closer metallurgical control than has been obtainable heretofore. Rustless Iron and Steel Corp., Baltimore, Md. (B 1488)

Dipping Baskets

In addition to the 14 standard designs, this company will manufacture baskets to specifications. C. O. Jelliff Mfg. Corp., Southport, Conn. (B 1489)

Yoloy

A colorful bulletin summarizes the properties of the above alloy steel. Youngstown Sheet and Tube Co., Youngstown, O. (B 1490)

Electric Air Tempering Furnace

Comparative costs in operation of the new air tempering furnace and the old salt bath show a distinct saving by the use of the new furnace, as well as improvement in quality and uniformity, according to Leaflet 36A of the American Electric Furnace Co., Boston, Mass. (B 1491)

Colmonoy

Bulletin No. 50 is devoted to the wear-resistant, corrosion-resistant and heat-resistant alloys and overlay metals of the Colmonoy Co., Los Nietos, Calif. (B 1492)

Granite City Hi-Yield 1 and 2

This company offers two types of high elastic steel for use where abrasion resistance is required. Granite City Steel Co., Granite City, Ill. (B 1493)

Car Hearth Furnaces

Bulletin C-736 is devoted to these furnaces which were designed for uniform heating, sturdy construction and fuel economy. The Philadelphia Drying Machinery Co., Philadelphia, Pa. (B 1494)

Impact Tester

The Riehle "VV" variable velocity impact tester is the subject of a booklet of the Riehle Div., American Machine & Metals, Inc., New York, N. Y. (B 1495)

Industrial Furnaces

Oil, gas and electric furnaces are described and illustrated in Catalog No. 6 of the Mahr Manufacturing Co., Minneapolis, Minn. (B 1496)

Meehanite Metal

A specification chart of recommended grades for various service requirements has been issued by the Meehanite Metal Corp., Pittsburgh, Pa. (B 1497)

Ferrocarbo

This material containing both silicon and carbon combined in the form of silicon carbide acts as a graphitizer or softener when added to cast iron. Carborundum Co., Niagara Falls, N. Y. (B 1498)

Riveting Aluminum

A booklet which states that riveting is a satisfactory method of joining aluminum and its alloys contains useful data on this subject. Aluminum Co. of Amer., Pittsburgh, Pa. (B 1499)

Sand Conditioning

The claimed advantages and mechanism of the Speedmullor, which uses centrifugal force to mull more sand in less time with lower power cost, are described in an illustrated leaflet of the Beardsley & Piper Co., Chicago, Ill. (B 1500)

Wire Tester

Illustrated leaflet describes an improved type of machine for testing wire. Capacities are 0 to 250 lbs. and 0 to 500 lbs. Henry L. Scott Co., Providence, R. I. (B 1501)

Phosphor Bronze Bearings

General purpose bearings of many types and compositions described in a bulletin with tables of progressive size listing. Johnson Bronze Co., New Castle, Pa. (B 1502)

Magnet Steel

"Nipermag"—a permanent magnet alloy—is the subject of an illustrated booklet. Cinaudagraph Corp., Stamford, Conn. (B 1503)

Zinc Plating

Zin-O-Lyte, a process for bright zinc plating producing brilliant deposits direct from the bath without bright dipping, is the subject of a new bulletin of the Grasselli Chemicals Dept. of E. I. du Pont de Nemours & Co., Cleveland, O. (B 1504)

MANUFACTURERS' LITERATURE

Flame Hardening

New method of surface hardening which heats the metal with oxyacetylene flame almost simultaneously quenching it with water is described by the Air Reduction Sales Co., New York, N. Y. (B 1505)

What Scientists Say of Leitz Ultropak

Bulletin No. 17 describes the personal experience and applications to which Ultropak has been placed by scientific workers in various fields. E. Leitz, Inc., New York, N. Y. (B 1506)

Gasifier

A pamphlet on the Stewart gasifier claims that its use reduces fuel costs as much as 75%, produces a true gas of high B.t.u. value and is easier on furnace lining. Chicago Flexible Shaft Co., Chicago, Ill. (B 1507)

Positive Displacement Blowers

Bulletin 22-B12 discusses the structural features of these blowers. Roots-Connersville Blower Corp., Connersville, Ind. (B 1508)

Pyrometer Potentiometer

An improved potentiometer, unaffected by vibration, is featured in a leaflet of The Lewis Engineering Co., Naugatuck, Conn. (B 1509)

Furnace Atmospheres

The reprint of a paper by A. J. Fisher which presents data for use in solving furnace atmosphere problems from an engineering approach, is offered by the C. M. Kemp Mfg. Co., Baltimore, Md. (B 1510)

Electric Heating Units and Devices

Numerous small heating units for a multitude of tasks are listed in Bulletin GED-650 of the General Electric Co., Schenectady, N. Y. (B 1511)

Air Weight Control

The importance of air weight control, and the advantages of this company's controller, are given in a leaflet of The Foxboro Co., Foxboro, Mass. (B 1512)

Single-Stage Motorblowers

An illustrated catalog devoted to Type FS Motorblower lists many of the applications for which it is fitted. Ingersoll-Rand, New York, N. Y. (B 1513)

Adjustable Orifice and Proportioning Valves

Leaflet describing and illustrating the above is offered by The North American Mfg. Co., Cleveland, O. (B 1514)

Metal Melting Furnaces

Catalog No. 29 is devoted to the above furnaces, made interchangeable for gas or oil fuel. The Campbell-Hausfeld Co., Harrison, O. (B 1515)

Tantalum

Uses, physical properties and tables of working data on the above metal are given in a booklet of the Fansteel Metallurgical Corp., North Chicago, Ill. (B 1516)

Melting Furnace

The Walker furnace is identical with the cupola except that the metal is melted in a crucible, with decided advantages, according to this leaflet. Crucible Furnace Co., Inc., Charlottesville, Va. (B 1517)

Heat and Corrosion Resisting Alloys

Amsco Ni-Cr-Fe alloys are successfully used in scores of applications requiring excellent resistance to high temperatures and corrosive chemicals, according to this folder of the American Manganese Steel Co., Chicago Heights, Ill. (B 1518)

Heat Resisting Alloy Castings

Data on applications are given in a bulletin dealing with installations where strength at high temperatures must be provided. Ohio Steel Foundry Co., Springfield, Ohio. (B 1519)

Ladle Additions

Bar-Flux, a patented barium compound for use in acid or basic steel for ingots or castings, is featured in a booklet. Grades for use with non-ferrous metals. Si-Lux Co., Pittsburgh, Pa. (B 1520)

Combustion Safeguard

The Flame-otrol, a gas burner safety device, is designed to shut off the gas and prevent explosions in case of flame failure. Construction and operation described. Wheelco Instruments Co., Chicago, Ill. (B 1521)

Beryllium-Copper

This heat-treatable alloy is corrosion-resistant, non-rusting, non-sparking and nonmagnetic and possesses excellent electrical, tensile and fatigue properties. Composition, properties and applications are given in this catalog. Riverside Metal Co., Riverside, N. J. (B 1522)

Aluminum Flux

A pamphlet entitled "Look into the Ladle" describes how this flux supplies the chemical and metallurgical needs in the melting of aluminum. The Maluminum Co., Indianapolis, Ind. (B 1523)

Modern Gathmann Methods

A leaflet illustrates some of these methods and tells why they are vital to makers and users of steel. The Gathmann Engineering Co., Baltimore, Md. (B 1524)

Non-Ferrous Ingots

Ajax 7 point ingots have 7 outstanding advantages, according to this bulletin, which gives the A. S. T. M. specifications and examples of uses of bronzes, brasses and high lead alloys. Ajax Metal Co., Philadelphia, Pa. (B 1525)

Economical Cleaning of Castings

Whiting roller-bearing tumbling mills provide quick, low-cost dust-free cleaning of castings, according to catalog No. 217, which also gives detailed description of equipment and drives. Whiting Corporation, Harvey, Ill. (B 1526)

Reducing Oxidation and Decarburization in Heat Treating

R-S Furnace Pressure Control for oil and gas-fired heat treating operations improves uniformity by effecting even thermal distribution, balanced combustion and a minimum of surface alteration. R-S Products Corporation, Philadelphia, Pa. (B 1527)

Comparison Microscope

With the Busch comparison microscope the observer sees through a single eyepiece the magnified images of specimen and standard side by side without any separation. George Scherr Co., Inc., New York (B 1528)

Checker Brick

Technical data and uses of Superior open hearth checker brick, which is claimed to produce a solid stable checker volume, absolutely straight flues and fuel economy through interlocking construction, are given. William M. Bailey Co., Pittsburgh, Pa. (B 1529)

Hot Galvanizing

"A Guide to Longer Life for Iron and Steel Products" is the title of this interesting pamphlet giving the history, applications and advantages of hot galvanizing. American Hot Dip Galvanizers Assoc. Inc., Pittsburgh, Pa. (B 1530)

Temperature and Pressure Instruments

This new 56 page catalog (No. 1[illegible]60C) gives complete structural, installation and operating data for TAG indicating and recording temperature and pressure instruments. C. J. Tagliabue Mfg. Co., Brooklyn, N. Y. (B 1531)

Silicate Cements for Acid Resistance

Reprints of a paper by F. D. Snell and H. Farkas on "Quick-setting Silicate of Soda Cements for Acid-proof Tank and Tower Construction" are offered by U. S. Stoneware Co., Akron, Ohio. (B 1532)

Charger for Small Cupolas

The Tiger Skip-Hoist Cupola charger, claimed to make possible low cost hot metal from small cupolas with better control and easier operation, is described in folder of the Whiting Corporation, Harvey, Ill. (B 1533)

Microscopes and Auxiliary Equipment

Toolmakers' wide field binocular, junior binocular, and shop microscopes, together with Brinell and tube microscopes and optical aids are described and illustrated in catalog D-22 of Bausch & Lomb Optical Co., Rochester, N. Y. (B 1534)

MANUFACTURERS' LITERATURE

Metallurgical Testing Equipment

Louis Schopper metal testing machines and appliances for measuring tensile, compression or torsional strength, elongation, hardness, impact resistance, etc., are described in catalog 390. Testing Machines, Inc., New York, N. Y. (B 1535)

Handling Heat

Alundum and Crystolon refractories for furnace and kiln linings and parts resist spalling, warpage, deformation under load and are of uniform dimensions according to publication No. 5 of the Norton Company, Worcester, Mass. (B 1536)

Dehumidifiers

Lectrodryer systems, employing Activated Alumina for drying air and other gases by adsorption, are described in this well illustrated booklet by the Pittsburgh Lectrodryer Corp., Pittsburgh, Pa. (B 1537)

Metallographic Polishing Machines

Direct drive (no belt or friction drive) polishing machines are described as providing operating smoothness, sturdiness and flexibility in this bulletin of the Cincinnati Electrical Tool Co., Cincinnati, Ohio. (B 1538)

Heat Treating Furnaces

Electric and fuel fired furnaces for annealing, forging, hardening and die casting and burner accessories are illustrated in Bulletin No. 39. W. S. Rockwell Co., New York. (B 1539)

Corrosion Resisting Equipment

New catalog of equipment made exclusively to handle corrosive solutions gives complete data, including sizes, capacities and engineering information, on materials, parts, containers, etc. Duriron Company, Inc., Dayton, Ohio. (B 1540)

Ladle Pouring Brick

Ironton ladle pouring bricks for hand, bull and crane ladles are claimed to reduce losses caused by slag entering the molds Ironton Fire Brick Co., Ironton, Ohio. (B 1541)

Furnace Insulation

Thermal Vermiculite insulating products for temperatures up to 2200 deg. F. are described in a leaflet issued by Thermal Products Corporation, Pittsburgh, Pa. (B 1542)

Furnaces and Foundry Accessories

Bulletin No. 54 pictures various Fisher Crucible Melting Furnaces, as well as a variety of essential foundry accessories. Fisher Furnace Co., Chicago, Ill. (B 1543)

New Portable Pyrometer

Details of construction and operation of the Pyramid Pyrometer, which features quick calibration, flexible arm, and pistol type grip with conveniently visible dial, are given in this leaflet. Tamms Silica Co., Chicago, Ill. (B 1544)

Precision Valve for Furnaces

The improved Mehler precision valve, claimed to afford extremely fine regulation of fuel flow, is introduced to the general furnace field. Operating data are given. Mehler, Inc., Pittsburgh, Pa. (B 1545)

Midvaloy No. 77

An unusual oil hardening alloy steel for use in ball races, balls and bearings, taps and tapper taps, etc., is described in a leaflet of The Midvale Co., Nicetown, Philadelphia, Pa. (B 1546)

Everdur

This metal is a high strength, non-magnetic, non-sparking alloy of the solid solution type composed of copper, silicon and other controlled elements, according to this illustrated leaflet. American Brass Co., Waterbury, Conn. (B 1547)

Properties of OFHC Copper

An attractive booklet contains reprints of three papers relating to the above subject. United States Metals Refining Co., New York, N. Y. (B 1548)

Sixteen Sins of the Cleaning Room

Are listed in a circular for convenience in checking on cleaning rooms. Great Lakes Foundry Sand Co., Detroit, Mich. (B 1549)

Cataloy Lead Bronze

This process which is guaranteed to perfectly combine copper and lead in your own plant is described in literature from Cataloy, Los Angeles, Cal. (B 1550)

Vanadium Steels

Various of these steels for locomotive and car construction are described in a booklet. Vanadium Corp., of America, New York, N. Y. (B 1551)

Alloy Castings

Corrosion-resistant and stainless steel castings are the subject of a new booklet. Michiana Products Corp., Michigan City, Ind. (B 1552)

Chain and Belt Conveyors

Bulletin 1-B discusses conveyors for use at high temperature. Michigan Steel Castings Co., Detroit, Mich. (B 1553)

Silico-Manganese Spring Steel

Extreme care is taken in processing this steel to avoid imperfection, according to the manufacturer. Illustrated. Bethlehem Steel, Bethlehem, Pa. (B 1554)

Beryllium Copper

Data on properties, heat treatment and fabrication of this copper alloy are given in an illustrated leaflet of The Beryllium Corp. of Penna., Reading, Pa. (B 1555)

Air Setting Bond for Firebrick

Wal-Set, for bonding firebrick and other refractory materials, is the subject of an illustrated pamphlet. Wahl Refractory Products Co., Fremont, O. (B 1556)

Lithoform

This non-inflammable liquid makes paint stick to galvanized iron and other metals that shed paint. American Chemical Paint Co., Ambler, Pa. (B 1557)

Low Voltage Generators

Advanced features of design permitting light weight, compact size, more efficient performance and continuous operation are claimed for these generators. Columbia Electric Mfg. Co., Cleveland, O. (B 1558)

3300 Deg. Super Refractory

An illustrated catalog devoted to "Shamva" Mullite contains information regarding its background, characteristics and uses. Mullite Refractories Co., Shelton, Conn. (B 1559)

Hi-Steel

Information concerning chemical composition, physical properties and corrosion resistance of this steel is offered by the Inland Steel Company, Chicago, Ill. (B 1560)

Tool Steels

A looseleaf handbook contains detailed instructions for forging, annealing, hardening and tempering each grade of steel with the resulting hardnesses; general working instructions, etc. Crucible Steel Co. of America, New York, N. Y. (B 1561)

Radium for Industrial Radiography

This article written by R. A. Gezelius and C. W. Briggs, containing interesting and important information on the subject, is published in handy booklet form. Radium Chemicals Co., Inc., New York, N. Y. (B 1562)

Weld It Well!

This colorful bulletin, No. HW-4, covers the complete line of P&H-Hansen arc welders from 50 to 800-ampere units, as well as welding fixtures and accessories. Generously illustrated. Harnischfeger Corp., Milwaukee, Wis. (B 1563)

Microscopes and Accessories

General information is given, and various equipments are illustrated and described in the Zeiss catalog. Carl Zeiss, Inc., New York, N. Y. (B 1564)

Controlling Structural Composition

The Micro-"Metalix" apparatus, affording a method of testing non-destructively the structural composition of light metal alloys and controlling this in the various stages of manufacture is described in a leaflet of the Philips Metalix Corp., Mt. Vernon, N. Y. (B 1565)

Hardening High Speed Steel

Bulletin No. 1012-3 is devoted to this company's Diamond block method of control for hardening high speed steel in a neutral, or other atmosphere. The Sentry Co., Foxboro, Mass. (B 1566)

New Temperature Controller

Smooth proportional valve action, combined with the potentiometer principle of temperature control, is provided in the new Fulscope Micromax Air-operated Potentiometer Controller, produced by Taylor in conjunction with Leeds and Northrup and described in Catalog 101 R. Taylor Instrument Co., Rochester, N. Y. (B 1567)

(Continued from Page P 11)

10:40 A.M. —*"The Heat Treatment of High Speed Steels in Salt Baths,"* Axel Hultgren, Consulting Metallurgist, Stockholm, Sweden.

11:20 A.M. —*"A New Application for the Short-Time High Temperature Tensile Test,"* C. L. Clark, A. E. White and C. J. Guarnieri, University of Michigan, Ann Arbor, Mich.

AFTERNOON SESSION

Auditorium Ball Room

2:00 P.M. —*"Austenitic Grain Size of Eutectoid Steel,"* Harry Tobin and R. L. Kenyon, American Rolling Mill Co., Middletown, Ohio.

2:40 P.M. —*"Some Factors Influencing Austenitic Grain Size in High Purity Steels,"* G. Derge, Carnegie Institute of Technology, A. R. Kommel, United Engineering and Foundry Co., Vandergrift, Pa., and R. F. Mehl, Carnegie Institute of Technology, Pittsburgh.

3:20 P.M. —*"Relation of Pre-Treatment of Steels to Austenitic Grain Growth,"* J. E. Dorn and O. E. Harder, Battelle Memorial Institute, Columbus, Ohio.

Auditorium

Educational Lectures

4:30 P.M. —*"Steel Making,"* Earnshaw Cook, American Brake Shoe & Foundry Co., Mahwah, N. J.

8:00 P.M. —*"Metallographic Technique,"* J. R. Vilella, United States Steel Corp., Kearny, N. J.

WEDNESDAY, OCTOBER 20

MORNING SESSION

Ambassador Hotel

ANNUAL MEETING OF THE A.S.M.

1937 Edward De Mille Campbell Memorial
Lecture presented by W. P. Sykes
General Electric Co., Cleveland

AFTERNOON SESSION

Auditorium Ball Room

2:00 P.M. —*"The Effect of Mass Upon the Mechanical Properties of Cast Steel,"* C. W. Briggs and R. A. Gezelius, U. S. Naval Research Laboratories, Washington.

2:40 P.M. —*"The Fatigue Resistance of Steel as Affected by Some Cleaning Methods,"* J. H. Frye, Jr., and G. L. Kehl, Lehigh University, Bethlehem, Pa.

3:20 P.M. —*"Influence of Heat Treatment on Creep of Carbon-Molybdenum and Chromium-Molybdenum-Silicon Steel,"* R. F. Miller, R. F. Campbell, R. H. Aborn, U. S. Steel Corp., Kearny, N. J., and E. C. Wright, National Tube Co., Pittsburgh.

Auditorium

Educational Lectures

4:30 P.M. —*"Steel Making,"* Earnshaw Cook, American Brake Shoe & Foundry Co., Mahwah, N. J.

8:00 P.M. —*"Metallographic Technique,"* J. R. Vilella, United States Steel Corp., Kearny, N. J.

(Continued on page P 92)

(Continued from page P 30)

S

Safety Gas Lighter Co., Booth B-36. Gas lighters, gas ranges, hot water heaters.
George Scherr Co., Inc., Booth D-76. Optical instruments and testing machines.
Scully Steel Products Co., Booth—stage. (See United States Steel Corp.)
Selas Co., Gas Section. Gas premixers, burners, soldering systems.
Sentry Co., Booth F-1. Hardening furnaces, high temperature tube furnaces.
Seymour Mfg. Co., Booth F-92. Nickel silver, phosphor bronze, sheet blanks, wire rods, shells, etc.
Shakeproof Lock Washer Co., Booth D-10. Lock washers.
Shenango-Penn Mold Co., Booth D-83. Centrifugally cast bronze and bronze products.
Sleeper & Hartley, Inc., Booth H-65. Wire and spring making machinery.
Spencer Turbine Co., Booth B-71. Turbo compressors, vacuum cleaners.
Steel, Booth L-2. Publications.
Steel City Testing Laboratory, Booth F-18. Testing machines.
Stoody Co., Booth H-88. Hard facing materials, cutting tools.
D. A. Stuart & Co., Booth B-44. Industrial oils and greases.
Surface Combustion Corp., Gas Section. Heat treating furnaces, burners. accessories.
Syncro Machine Co., Booth F-2. Wire machinery.

T

C. J. Tagliabue Mfg. Co., Booth B-41. Indicating, recording and controlling pyrometers.
Taylor Hall Welding Corp., Booth H-75. Welding machines.
Tennessee Coal, Iron and Railway Co., Booth—stage. (See United States Steel Corp.)
Thermal Products Corp., Booth G-17. Insulating materials.
Timken Roller Bearing Co., Booth E-48. Alloy steels.
Titanium Alloy Mfg, Co., Booth F-76. Titanium alloys and compounds.
Torrington Mfg. Co., Booth H-9. Wire manufacturing machines.

U

Una Welding, Inc., Booth G-22. Welding machines.
Union Carbide and Carbon Corp., Booth H-52. Welding and cutting equipment, ferro-alloys, heat and corrosion resisting alloys.
Unitcast Corp., Booth C-91. Steel castings.
United States Steel Corp., Booth—stage. Alloy steels, high tensile steels, stainless steels.
Universal-Cyclops Steel Corp., Booth H-84. Tool steels, stainless and specialty steels.

V

Vanadium-Alloys Steel Co., Booth G-32. Vanadium steel, tool steels.
Vanadium Corp. of America, Booth H-20. Vanadium alloys and compounds.
Victor Saw Works, Inc., Booth B-39. Hacksaw blades and machines.

W

Welding Engineer, Booth A-42. Publications.
Wells Mfg. Corp., Booth H-21. Metal cutting saws.
Westinghouse Electric & Mfg. Co., Booth E-19. Welding equipment and electric furnaces.
Wheelco Instruments Co., Booth B-84. Temperature control instruments.
Wiedemann Machine Co., Booth A-46. Turret punches.
H. A. Wilson Co., Booth B-7. Platinum alloys, precious metals, thermostatic metals.
Wilson Mechanical Instrument Co., Booth C-50. Rockwell hardness testers.
Wilson Welder & Metals Co., Booth E-62. Electric welding machines.
Wire Association, Booth A-40. Educational exhibit.

Y

Youngstown Sheet & Tube Co., Booth A-63. Alloy steels.

Z

Carl Zeiss, Inc., Booth G-80. Microscopes and accessories.

Hydrides and Metals

PRODUCTS OF THE HYDRIDE PROCESS

METALLIC hydrides are dissociated on heating above 300°C and give off large volumes of nascent hydrogen.

They are recommended as the source of a supply of 100% pure hydrogen.

Metallic hydrides offer new possibilities in the production of alloys due to the liberation and protective effect of nascent hydrogen during the alloying process.

Metallic hydrides are safer to handle than fine powdered metals in degassed state.

The hydrides on degassing supply pure metals either in the form of very fine powders or sintered ingots.

If you are interested in nascent hydrogen or new alloys which can be made by this process, write us for detailed information and advice.

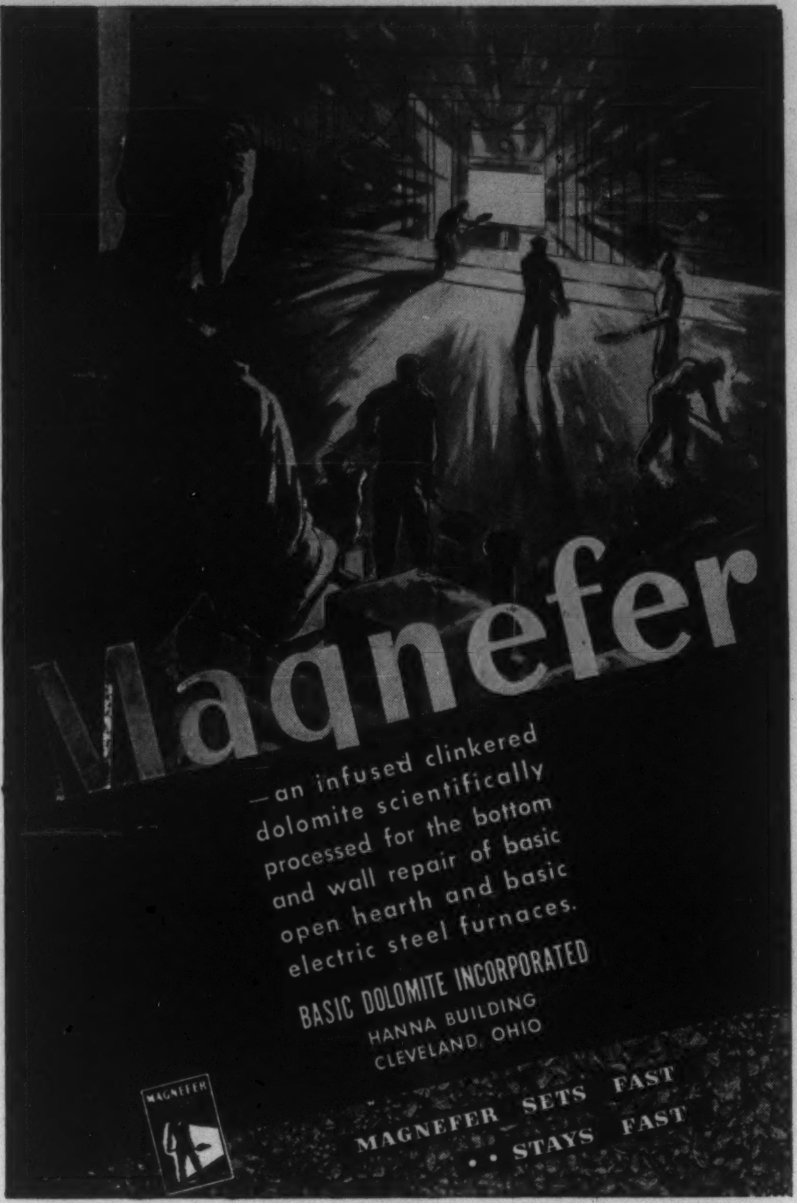
PRODUCTS	AVAILABLE FORMS
Titanium Hydride	Powder 200-300 mesh
Zirconium Hydride	Powder 200-300 mesh
Thorium Hydride	Powder 200-300 mesh
Calcium Hydride	Lumps or Powder
Titanium Metal	Powder 200-300 mesh
Zirconium Metal	Powder 200-300 mesh
Thorium Metal	Powder 200-300 mesh
Uranium Metal	Powder 200-300 mesh
Copper-Titanium Alloys	
1) Ti—30%	Ingots
2) Ti—60%	Powder 200-200 mesh
Copper-Zirconium Alloy Zr 13%	Ingots
Nickel-Titanium Alloys Ti 20 to 60%	Ingots

Patents issued and pending in the U.S.A. and Foreign Countries

**HYDRIDES
AND
METALS**

METAL HYDRIDES INC.

BOX 816, CLIFTON, MASSACHUSETTS



Magnefer

—an infused clinkered dolomite scientifically processed for the bottom and wall repair of basic open hearth and basic electric steel furnaces.

BASIC DOLOMITE INCORPORATED
HANNA BUILDING
CLEVELAND, OHIO

MAGNEFER SETS FAST . . STAYS FAST

TESTING MACHINES

Modern Design

Superior quality and performance

Moderate Cost

A complete line of testing machines for almost every purpose including various types of Tensile, Transverse and Compression Testers. Hand, Power, and Direct Reading Brinells. Automatic and manually operated Conveyor Type Brinnells, Power Driven and Portable Sheet Metal Testers, Torsion Testers, Sand Testing Equipment, etc.

Special equipment designed and built to your requirements.

Many of the above machines on display at our

Booth H-39

See them in operation or write.

DETROIT TESTING MACHINE COMPANY
5137 Trumbull Avenue Detroit, Michigan

THURSDAY, OCTOBER 21

(Continued from page P 86)

MORNING SESSION

Ambassador Hotel

Symposium on Carburizing

10:00 A.M. —*"A Review of Some Fundamentals of Carburizing,"* M. A. Grossmann, Carnegie-Illinois Steel Corp., Chicago.

10:40 A.M. —*"A Theoretical Discussion of the Action of Solid Carburizing Agents,"* H. W. McQuaid, Republic Steel Corp., Massillon, Ohio.

11:20 A.M. —*"Gaseous Media for Carburizing,"* G. T. Williams, Cleveland Tractor Co., Cleveland.

Simultaneous Session

Ambassador Hotel

10:00 A.M. —*"The Initial Stages of Graphitization,"* H. A. Schwartz and M. K. Barnett, National Malleable and Steel Castings Co., Cleveland.

10:40 A.M. —*"An X-Ray Study of the Ar_3 and Ac_3 Points of Iron and Iron-Nickel Alloys,"* Sidney D. Smith, Pennsylvania State College, State College, Pa.

11:20 A.M. —*"Graphitization in High Purity Iron-Carbon Alloys,"* Cyril Wells, Carnegie Institute of Technology, Pittsburgh.

AFTERNOON SESSION

Auditorium Ball Room

Symposium on Carburizing

2:00 P.M. —*"Factors Governing Selection of Type of Carburized Case,"* A. L. Boegehold and C. J. Tobin, General Motors Corp., Detroit.

2:30 P.M. —*"Furnace Atmospheres and Decarburization,"* J. A. Webber, Interstate Drop Forge Co., Milwaukee.

3:00 P.M. —*"Steels Used in the Carburizing Process,"* O. W. McMullan, Youngstown Sheet & Tube Co., E. Chicago, Ind.

3:30 P.M. —*"A Hardenability Test for Carburizing Steel,"* W. E. Jominy and A. L. Boegehold, General Motors Corp., Detroit.

Simultaneous Session

Auditorium—Room B

2:00 P.M. —*"Solubility of Copper in the Grain-Boundary Material of a Solid Solution of Copper in Zinc,"* G. R. Dean, Miner Laboratories, Chicago, and W. P. Davey, Pennsylvania State College, State College, Pa.

2:40 P.M. —*"The Rate of Austenite Transformation in Cast Iron,"* D. W. Murphy, W. P. Wood and D. Giradi, University of Michigan, Ann Arbor, Mich.

3:20 P.M. —*"The Effects of Columbium and Other Addition Agents on Low Chromium Steels,"* Russell Franks, Union Carbide and Carbon Research Laboratories, Inc., Niagara Falls, N. Y.

Auditorium

Educational Lecture

4:30 P.M. —*"Steel Making,"* Earnshaw Cook, American Brake Shoe & Foundry Co., Mahwah, N. J.

(Continued on page P 94)

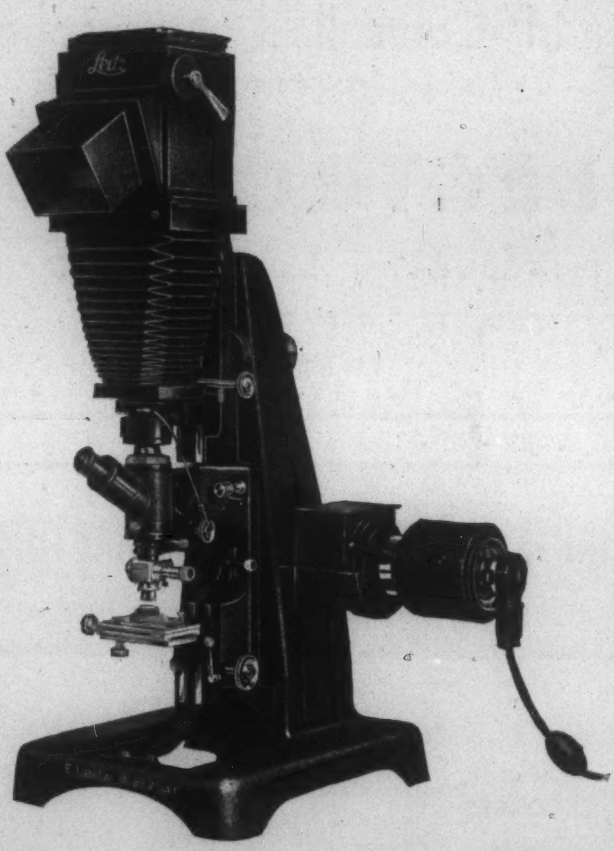
Leitz EXHIBITS

AT THE NATIONAL METAL EXPOSITION

in Atlantic City October 18 to 22, 1937

in Booth G-14

Among the instruments to be exhibited are:



MICROSCOPES

Aside from improved models of the well-known Leitz Micro-Metallograph Models "MM-1" and "MM-2", and the accessories for darkfield and polarized light, we draw special attention to a complete line of inexpensive upright microscopes for laboratory use and primarily for visual observation which are equipped with the same modern illuminators for vertical, as well as darkfield, illumination in reflected light and also equipped for observations in polarized reflected light.

DILATOMETERS

For automatically making photographic records of temperature expansion curves of metals with exceptionally high precision. Also used for determining other thermal characteristics of metals.

PANPHOT

The most efficient combination of the most Universal microscope with a photographic camera. This instrument meets the demand for an instrument of ever-increasing versatility for microscopic research and photomicrographic recording.

POLISHING MACHINES

The "Guthrie-Leitz" Polishing Machine with superior multiple specimen holder, variable speed motor, automatic rotator, magnetically controlled pressure and other features.

LEICA AND ACCESSORIES

A complete and up-to-date line of Leica Cameras and the most important accessories will be exhibited. We draw particular attention to the demonstration of lantern slides of Kodachrome films in natural colors and the possibilities of applying this type of film to scientific photography.

Leitz
Leica

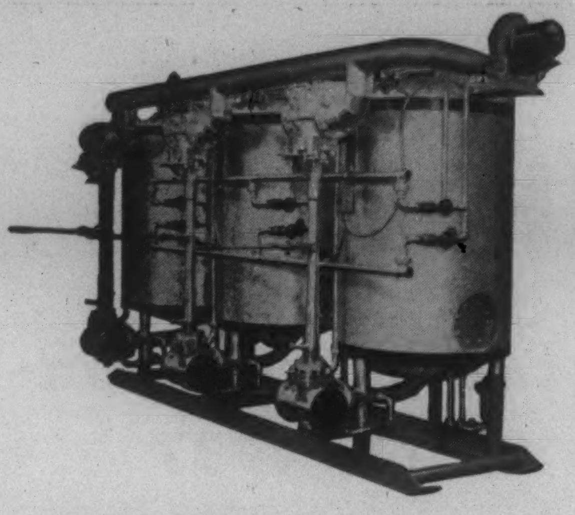
E. LEITZ, Inc.

730 Fifth Avenue New York, N. Y.

Washington Chicago Detroit

Western Agents:
Spindler & Sauppe, Inc., Los Angeles - San Francisco

● *Our Technical Staff will gladly discuss your special problems regarding equipment for your particular type of work.*



For Control of

H2 O

In Controlled Atmospheres

INVESTIGATE THE

LECTRODRYER

PITTSBURGH LECTRODRYER CORP.

32nd Street & Allegheny River

PITTSBURGH, PENNA.

BARTLEY CRUCIBLE AND REFRACTORIES, Inc.

MANUFACTURERS OF

LAWTONITE GRAPHITE AND CLAY PRODUCTS TRADE MARK REG. U.S. PAT. OFF.

GRAPHITE CRUCIBLES
RETORTS
BRAZING SPECIALTIES

STANDARD SHAPES
COVERS, BASES
TILE FURNACE LININGS

SUPER-REFRACTORIES

This company recognizes the fact that quality and service are essential in the manufacture of crucibles and retorts.

In order to keep our quality under control we maintain our own laboratories for the testing and analyzing of all raw materials, mixed batch, etc. This work is done under the supervision of expert ceramists. Complete sizes carried in stock.

Write for our catalog.

TRENTON, N. J.

FRIDAY, OCTOBER 22

(Continued from page P 92)

MORNING SESSION

Ambassador Hotel

Symposium on Carburizing

10:00 A.M. —"*Production Carburizing,*" E. F. Davis, Warner Gear Div., Borg-Warner Corp., Muncie, Ind.

10:40 A.M. —"*A Study of Commercial Carburizing Containers,*" R. W. Roush and A. C. Dames, Timken-Detroit Axle Co., Detroit.

11:20 A.M. —"*The Physical and Chemical Characteristics of Carburizing Compounds and Their Handling in Production,*" S. L. Widrig, Spicer Manufacturing Co., Toledo, Ohio.

Simultaneous Session

Ambassador Hotel

10:00 A.M. —"*Effects of Longitudinal Scratches on Valve Spring Wire,*" F. P. Zimmerli, Barnes-Gibson-Raymond, Detroit, W. P. Wood, University of Michigan, Ann Arbor, Mich., and G. D. Wilson, Barnes-Gibson-Raymond, Detroit.

10:40 A.M. —"*Recovery of Cold-Worked Nickel on Annealing,*" Erich Fetz, Wilbur B| Driver Co., Newark, N. J.

11:20 A.M. —"*Metal Coloring,*" C. B. F. Young, Columbia University, New York City.

AFTERNOON SESSION

Auditorium Ball Room

Symposium on Carburizing

2:00 P.M. —"*Commercial Gas Carburizing,*" L. D. Gable and E. S. Rowland, Timken Roller Bearing Co., Canton, Ohio.

2:40 P.M. —"*Light Cases by Gas Carburizing,*" V. T. Malcolm Chapman Valve Manufacturing Co., Indian Orchard, Mass.

3:20 P.M. —"*Liquid Bath Carburizing,*" B. B. Beckwith, Chrysler Corp., Detroit.

SIMULTANEOUS SESSION

Auditorium—Room B

2:00 P.M. —"*A Study of Deoxidation Type Inclusions in Alloy Steels,*" W. A. Hare and Gilbert Soler, Timken Roller Bearing Co., Canton, Ohio.

2:40 P.M. —"*Some Problems in the Production of Low-Carbon Sheets in Non-Continuous Mills,*" M. L. Samuels and Alfred Boyles, Battelle Memorial Institute, Columbus, Ohio.

3:30 P.M. —"*Relation of Size of Spheroids in Tool Steel to its Machinability and to Holding Edge of Cutter,*" D. E. Roda, International Business Machines Corp., Rochester, N. Y.

Auditorium

Educational Lecture

4:30 P.M. —"*Steel Making,*" Earnshaw Cook, American Brake Shoe & Foundry Co., Mahwah, N. J.

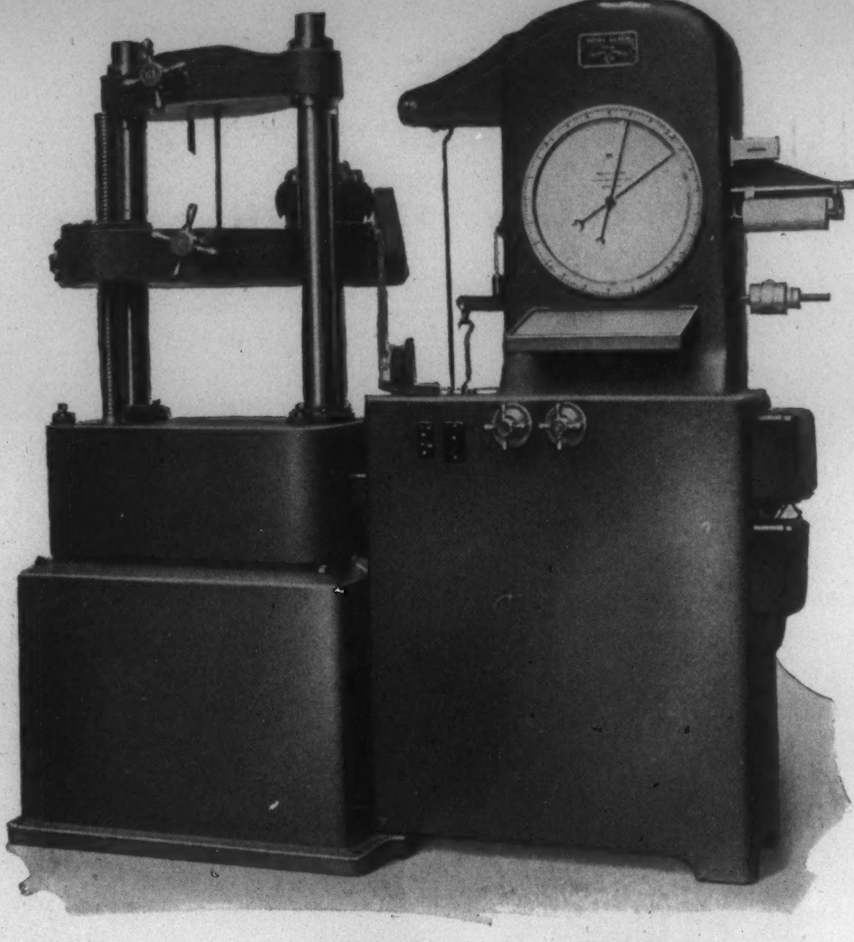
STANDARD THROUGH THE YEARS

Olsen Testing Machines—

As durable, dependable and well designed as they look.

As precise, smooth-acting, and sensitive as expert and conscientious workmanship, based on half a century of specialized experience, can make them.

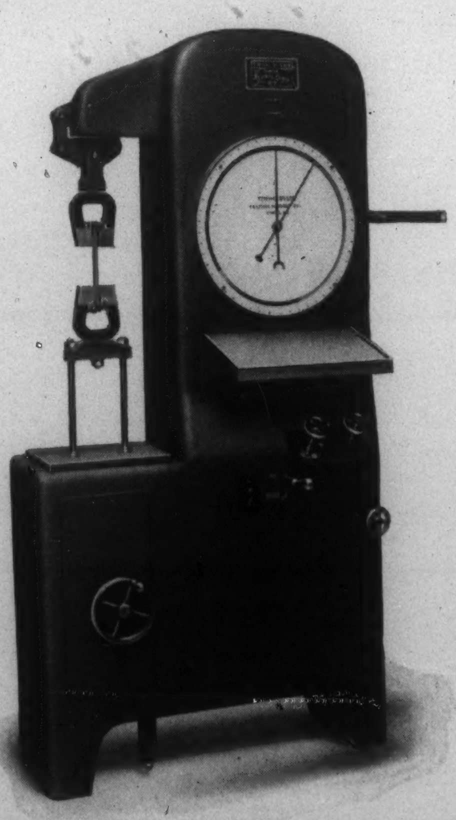
On display at the A. S. M. Atlantic City Convention Exhibit.



Universal Testing Machine
100,000 Pounds Capacity
Hydraulic Loading—Vernier Control
Olsen Instantaneous Pendulum Weighing
Three Capacity Ranges
The modern, general utility machine.

For the all-purpose machine, where simplicity, ease of control, ruggedness, and long-time accuracy and reliability are required, there is no better combination than the hydraulic-loading, Olsen pendulum weighing machine.

We mail, on request, catalogues covering all of our many types of testing machines and instruments.



Universal Testing Machine
5,000 Pounds Capacity
Hydraulic loading—Vernier Control—Quick return.
Olsen Instantaneous Pendulum Weighing
Three Capacity Ranges. *This is the wire and sheet machine.*

TINIUS OLSEN TESTING MACHINE CO.

500 N. 12TH ST., PHILADELPHIA, PA

Advertisers' Index

PREVIEW SECTION

Air Reduction Sales Company ... P 16, P 17
Ajax Electric Company, Inc. Insert between pages P 32 & P 33
Ajax Electric Furnace Corporation Insert between pages P 32 & P 33
Ajax Electrothermic Corporation Insert between pages P 32 & P 33
Ajax Metal Company .. Insert between pages P 32 & P 33
Aluminum Company of America ... P 66, P 67
American Brass Company Insert between pages P 76 & P 77
American Cyanamid & Chemical Corporation ... P 51
American Electric Furnace Company ... P 47
American Metal Company, Ltd. ... P 70
American Steel & Wire Company ... P 36, P 37
Automatic Gasflux, Inc. ... P 56

Baldwin-Southwark Corporation ... P 49
Bartley Crucible and Refractories, Inc. ... P 94
Basic Dolomite, Inc. ... P 92
Bausch & Lomb Optical Company ... P 28
Buehler, Adolph I. ... P 58

Carborundum Company ... P 40, P 41, P 75
Carnegie-Illinois Steel Corporation ... P 36, P 37
Chapman Valve Manufacturing Company ... P 80
Cinaudagraph Corporation ... P 74
Cincinnati Electrical Tool Company ... P 54
Cleveland Twist Drill Company ... P 73
Columbia Steel Company ... P 36, P 37

Detroit Rex Products Company ... P 60
Detroit Testing Machine Company ... P 92
Dow Chemical Company ... P 77
Duraloy Company ... P 87
Duriron Company, Inc. ... P 35

Electric Furnace Company ... P 3
Electro Alloys Company Insert between pages P 80 & P 81
Electro Metallurgical Company ... P 33

Firth-Sterling Steel Company ... P 23

General Alloys Company ... P 53
General Electric Company ... P 12, P 13
Globar Division, Carborundum Company ... P 75

Handy & Harman ... P 61
Hayes, Inc., C. I. ... P 69
Holden Company, A. F. ... P 20, P 21
Houghton & Company, E. F. ... P 31

Illinois Testing Laboratories, Inc. ... P 71
International Nickel Company, Inc. .. Outside Back Cover

Jelliff Manufacturing Corporation, C. O. ... P 50
Johns-Manville Corporation ... P 24, P 25
Jones & Laughlin Steel Corporation ... P 8, P 9

Leeds & Northrup Company ... P 7
Leitz, Inc., E. ... P 93
Lepel High Frequency Laboratories, Inc. ... P 62
Lindberg Engineering Company ... P 81

Metal Hydrides, Inc. ... P 91
Michiana Products Corporation ... P 57
Michigan Steel Casting Company ... P 39
Mullite Refractories Company ... Inside Back Cover

National Alloy Steel Company ... P 72
National Tube Company ... P 36, P 37
Nitralloy Corporation ... P 4, P 5
Norton Company ... Insert between pages P 68 & P 69

Ohio Crankshaft Company Insert between pages P 64 & P 65
Ohio Ferro-Alloys Corporation Insert between pages P 80 & P 81
Ohio Steel Foundry Company ... P 76
Olsen Testing Machine Company, Tinius ... P 95

Pettinos, Inc., George F. ... P 55
Pittsburgh Lectrodryer Corporation ... P 94
Pittsburgh Lectromelt Furnace Corporation ... P 68

Ryerson & Son, Inc., Joseph T. Insert between pages P 26 & P 27

Seymour Manufacturing Company ... P 89
Spencer Turbine Company ... Inside Front Cover
Standard Alloy Company, Inc. ... P 29
Surface Combustion Corporation ... P 43, P 44, P 45
Swan Pencil Company ... P 74

Tagliabue Manufacturing Company, C. J. ... P 52
Tennessee Coal, Iron & Railroad Company .. P 36, P 37
Titanium Alloy Manufacturing Company ... P 65

Union Carbide & Carbon Corporation ... P 33
United States Metals Refining Company ... P 70
United States Steel Corporation ... P 36, P 37
United States Steel Products Company ... P 36, P 37

Vanadium Corporation of America ... P 59

Westinghouse Electric & Manufacturing Company P 78, P 79
Wilson Welder & Metals Company, Inc. ... P 16, P 17

Zeiss, Inc., Carl ... P 63

ADVERTISING OFFICE
330 W. 42ND ST., NEW YORK, N.Y.

PHILIP H. HUBBARD . . *Publishing Director*
WM. P. WINSOR . . . *Business Manager*
D. B. MCINTOSH . *Eastern Advertising Manager*

BRANCH OFFICES
CHICAGO, ILL. . . . *310 South Michigan Avenue*
G. E. Cochran, Western Manager
CLEVELAND, OHIO . . . *1133 Leader Bldg.*
J. Howard Wilson, District Manager